



# **Sauget Area 2 Sites Group St. Louis, Missouri**

## **Sauget Area 2**



## **Human Health Risk Assessment Sauget Area 2 Sauget, Illinois**

### **Volume I: Main Text**

**ENSR Corporation  
August 31, 2003  
Document Number 06105-009-300**

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St. Louis, Missouri**

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AAF	Absorption Adjustment Factor
ABRTF	American Bottoms Regional Wastewater Treatment Facility
ACGIH	American Conference of Governmental Industrial Hygienists
AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
AWQC	Ambient Water Quality Criteria
bgs	below ground surface
CADD	Chronic Average Daily Dose
CAS	Chemical Abstracts Service
COC	Constituent of Concern
COPC	Constituent of Potential Concern
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
DDA	Downstream of the Discharge Area
DF	Dilution Factor
DQL	Data Quality Level
EFH	Exposure Factors Handbook
ELCR	Excess Lifetime Cancer Risk
EPC	Exposure Point Concentration
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IEPA	Illinois Environmental Protection Agency
IRIS	Integrated Risk Information System
LADD	Lifetime Average Daily Dose
LED10	Lower 95% Limit on a Dose Associated with a 10% Response
LMS	Linearized Multi-Stage
LOAEL	Lowest Observed Adverse Effect Level
MCL	Maximum Contaminant Level
MCPA	2-Methyl-4-chlorophenoxyacetic acid
MCPP	2-(2-Methyl-4-chlorophenoxy) propionic acid (MCP)
MLE	Most Likely Exposure
MOE	Margin of Exposure
MSL	Mean Sea Level
NCEA	National Center for Environmental Assessment
NCP	National Contingency Plan
NIOSH	National Institute of Occupational Safety and Health

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**LIST OF ACRONYMS (Cont'd)**

NOAA	National Oceanographic and Atmospheric Administration
NOAEL	No Observed Adverse Effect Level
NWS	National Weather Service
PAH	Polycyclic Aromatic Hydrocarbon
PC	Skin Permeability Constant
PCB	Polychlorinated Biphenyl
PDA	Plume Discharge Area
PEF	Particulate Emission Factor
PM10	Particulate Matter with Mean Diameter $\leq 10$ microns
PQL	Practical Quantitation Limit
PRG	Preliminary Remediation Goal
PRP	Potentially Responsible Party
QAPP	Quality Assurance Project Plan
RAGS	Risk Assessment Guidance for Superfund
RBC	Risk-Based Concentration
RfC	Reference Concentration
RfD	Reference Dose
RG	Remedial Goal
RI/FS	Remedial Investigation and Feasibility Study
RME	Reasonable Maximum Exposure
RO	Remediation Objective
SA2SG	Sauget Area 2 Sites Group
SOW	Scope of Work
SPLP	Synthetic Precipitation Leaching Procedure
SQL	Sample Quantitation Limit
SSL	Soil Screening Level
SSP	Support Sampling Plan
SVOC	Semi-Volatile Organic Compound
TACO	Tiered Approach to Corrective Action Objectives
TCDD	Tetrachlorodibenzo-p-dioxin
TCLP	Toxicity Characteristic Leaching Procedure
TEF	Toxic Equivalence Factor
TEQ	Toxic Equivalents Concentration
UCL	Upper Confidence Limit
UDA	Upstream of the Discharge Area
USACE	United States Army Corps of Engineers
USEPA	U S Environmental Protection Agency
VOC	Volatile Organic Compound
WHO	World Health Organization

**EXECUTIVE SUMMARY**

## EXECUTIVE SUMMARY

This report presents the baseline Human Health Risk Assessment (HHRA) for Sauget Area 2, located in Sauget and Cahokia, Illinois. On November 20, 2000, the Sauget Area 2 Sites Group (SA2SG) Potentially Responsible Parties (PRPs) signed an Administrative Order on Consent (AOC), Docket Number V-W-01-C-622, to perform a Remedial Investigation and Feasibility Study (RI/FS) at Sauget Area 2 Sites O, P, Q, R, and S. The U.S. Environmental Protection Agency (USEPA) signed the AOC on November 24, 2000. This HHRA is submitted to partially fulfill the requirements of Section V.2. of the AOC, and of Section 2.6 of Task 3 of the Scope of Work presented as Attachment B of the AOC. The HHRA was conducted to satisfy the AOC, as well as to be compliant with the National Contingency Program (NCP) (USEPA, 1990).

The HHRA was conducted in accordance with USEPA-approved Human Health Risk Assessment Workplan (HHRA Workplan) dated May 25, 2001 (including September 2001 and May 2002 revised pages), which was submitted as Section 11 of Volume 1 of the Support Sampling Plan (SSP) for Sauget Area 2 (URS, 2001). The HHRA Workplan is provided as Appendix A to this report.

The HHRA was conducted using data from environmental samples collected from the study area in accordance with the USEPA-approved SSP. The SSP for Sauget Area 2 was designed to investigate two major areas of the Sauget Area 2 study area (the media sampled in each are identified in parentheses):

- The Sites O, P, Q, R, and S (waste, soil, groundwater, leachate, ambient air – all sites; sediment, surface water, fish tissue – Site Q Pond only); and
- Mississippi River adjacent to the Sites (sediment, surface water and fish tissue).

The baseline HHRA has been conducted in accordance with the four-step paradigm for human health risk assessments developed by USEPA (USEPA, 1989a). The risk assessment results are summarized by step below.

### Data Evaluation and Hazard Identification

The purpose of the data evaluation and hazard identification process is two-fold: 1) to evaluate the nature and extent of release of constituents present at the site; and 2) to select a subset of these constituents identified as Constituents of Potential Concern (COPCs) for quantitative evaluation in the risk assessment. This step of the risk assessment involves compiling and summarizing the data for the risk assessment, and selecting COPCs based on a series of screening steps. Several factors were considered in selecting COPCs, including natural background, frequency of detection, and toxicity, and

essential nutrient status. COPC selection for evaluation in the quantitative HHRA was performed on each of the following media:

- Surface soil (0-6 inches below ground surface (bgs))
- Combined soil (combined surface, subsurface (6 feet bgs), and waste)
- Shallow groundwater, mid groundwater, and leachate
- Surface water
- Sediment
- Fish fillet

Screening was also performed for a separate analysis of deep groundwater and ambient air, which was not included in the quantitative HHRA. An evaluation of the soil-to-groundwater pathway was also performed.

COPCs were identified in Site O, Site O (North), Site P, Site Q (North), Site Q (Central), Site Q (South), and Site S surface soils. No COPCs were identified in Site R surface soils. COPCs in combined soils were identified in all sites for the construction worker direct-contact pathway. COPCs in combined soils for the ambient air pathway (non-excavation scenarios) were identified in all Sites with the exception of Site Q (Central).

The selection of COPCs for groundwater/leachate was conducted on a location-by-location basis. Samples with screening intervals or sample collection depths between 0 and 30 feet bgs were included in the evaluation. Because groundwater in the area is not used a source of drinking water, exposure to COPCs in groundwater could occur due to either volatilization of COPCs into indoor or outdoor air, or contact with COPCs in groundwater exposed in an excavation trench. Per the HHRA Workplan, a 15-foot bgs excavation depth is assumed (shallow groundwater, leachate). Moreover, volatilization from groundwater through the soil column to indoor and/or outdoor air is generally assumed to occur at depths of up to 30 feet bgs (shallow groundwater, mid groundwater/leachate). Based on these considerations, a total of 13 groundwater sampling locations were included in the evaluation. Of the 13 groundwater sampling locations and three leachate wells evaluated, COPCs were identified in only three groundwater locations and in all three leachate wells.

Arsenic was identified as the only COPC in Mississippi River sediment; no COPCs were identified in Mississippi River surface water. No COPCs were identified in Site Q Pond sediment. Several COPCs were identified in the Site Q Pond surface water. COPCs were identified in fish fillet samples from both the Mississippi River and the Site Q Ponds.

## Dose-Response Assessment

The purpose of the dose-response assessment is to identify the types of adverse health effects a constituent may potentially cause, and to define the relationship between the dose of a constituent and the likelihood or magnitude of an adverse effect (response) (USEPA, 1989a). Adverse effects are classified by USEPA as potentially carcinogenic or noncarcinogenic (i.e., potential effects other than cancer). Dose-response relationships are defined by USEPA for oral exposure and for exposure by inhalation. Oral toxicity values are also used to assess dermal exposures, with appropriate adjustments, because USEPA has not yet developed values for this route of exposure. Combining the results of the toxicity assessment with information on the magnitude of potential human exposure provides an estimate of potential risk. Sources of the published toxicity values in this risk assessment include USEPA's IRIS database (USEPA, 2003a), HEAST (USEPA, 1997b), and the USEPA NCEA in Cincinnati, Ohio.

## Exposure Assessment

The purpose of the exposure assessment is to predict the magnitude and frequency of potential human exposure to each of the COPCs retained for quantitative evaluation in the HHRA. The first step in the exposure assessment process is the characterization of the setting of the site and surrounding area. Current and potential future site uses and potential receptors (i.e., people who may contact the impacted environmental media of interest) are then identified. Potential exposure scenarios identifying appropriate environmental media and exposure pathways for current and potential future site uses and receptors are then developed. Those potential exposure pathways for which COPCs are identified and are judged to be complete are evaluated quantitatively in the risk assessment. Both Reasonable Maximum Exposure (RME) and Most Likely Exposure (MLE) scenarios were evaluated for each receptor in the HHRA.

To guide identification of appropriate exposure pathways and receptors for evaluation in the risk assessment, a conceptual site model (CSM) for human health was developed. The purpose of the CSM is to identify source areas, potential migration pathways of constituents from source areas to environmental media where exposure can occur, and to identify potential human receptors based on current and future site uses. Based on the CSM, the following receptors and pathways were evaluated in the HHRA:

- On-site indoor industrial worker - potential exposure to COPCs via inhalation of volatile constituents present in indoor air due to vapor intrusion from groundwater/leachate.
- On-site outdoor industrial worker - potential exposure to COPCs in surface soil via incidental ingestion and dermal contact, and via inhalation of non-volatile COPCs that may be suspended as

dusts from surface soils, and to COPCs that may volatilize into outdoor air from underlying groundwater and from soils (combined surface soil, subsurface soil, and waste).

- Trespassing teenager - potential exposure to COPCs in surface soil via incidental ingestion and dermal contact, and via inhalation of non-volatile COPCs that may be suspended as dusts from surface soils, and to COPCs that may volatilize into outdoor air from underlying groundwater and from soils (combined surface soil, subsurface soil, and waste), and to COPCs in surface water and sediment from the Site Q Pond and the Mississippi River (note, no COPCs were identified in Site Q Pond sediment).
- On-site construction/utility worker - potential exposure to COPCs in soils (combined surface soil, subsurface soil, waste) via incidental ingestion and dermal contact, and via inhalation of volatile emissions and particulates suspended during excavation activity, and to COPCs in shallow groundwater and leachate via incidental ingestion and dermal contact, and via inhalation of COPCs volatilized from standing water in an excavation trench.
- Recreational fisher - potential exposure to COPCs in surface water, sediment, and fish fillet from the Site Q Pond and the Mississippi River (note, no COPCs were identified in Site Q Pond sediment).

Exposure Point Concentrations (EPCs) were derived using both measurement (analytical) data collected during the field investigation, and modeled data (e.g., volatilization to ambient and indoor air).

### **Risk Characterization**

The potential risk to human health associated with potential exposure to COPCs in environmental media at the site is evaluated in this step of the risk assessment process. Risk characterization is the process in which the dose-response information (Section 4.0) is integrated with quantitative estimates of human exposure derived in the Exposure Assessment (Section 5.0). The result is a quantitative estimate of the likelihood that humans will experience any adverse health effects given the exposure assumptions made. Two general types of health risk are characterized for each potential exposure pathway considered: potential carcinogenic risk and potential noncarcinogenic hazard. Carcinogenic risk is evaluated by averaging exposure over a normal human lifetime, which, based on USEPA guidance (1989a), is assumed to be 70 years. Noncarcinogenic hazard is evaluated by averaging exposure over the total exposure period.

The potential carcinogenic risk for each exposure pathway is calculated for each receptor. In current regulatory risk assessment, it is assumed that cancer risks are additive or cumulative. Pathway and area-specific risks were summed to estimate the total site potential cancer risk for each receptor. The total site cancer risks for each receptor group are compared to the USEPA's target risk range of  $10^{-4}$  to

$10^{-6}$ . Any COPC that causes an exceedance of the  $10^{-4}$  risk level for a particular receptor is designated a Constituent of Concern (COC). Both RME and MLE results are considered in the identification of COCs.

The target risk levels used for the identification of COCs are based on USEPA guidance and Illinois Tiered Approach to Corrective Action Objectives (TACO) guidance. Specifically, USEPA provides the following guidance (USEPA, 1991a):

“Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than  $10^{-4}$ , and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts.” and,

“The upper boundary of the risk range is not a discrete line at  $1 \times 10^{-4}$ , although EPA generally uses  $1 \times 10^{-4}$  in making risk management decisions. A specific risk estimate around  $10^{-4}$  may be considered acceptable if justified based on site-specific conditions.”

The Illinois Environmental Protection Agency (IEPA) provides the following summary for the evaluation of cumulative risk for carcinogens (IEPA, 2002b, Fact Sheet 13: Mixture Rule):

“The cumulative risk of carcinogenic contaminants attacking the same target must not exceed 1 in 10,000 [ $10^{-4}$ ]. Therefore, the risk from all on-site similar acting carcinogens must be added together. If this cumulative risk level is greater than 1 in 10,000, corrective action must be taken to reach an acceptable risk level.”

The potential for exposure to a constituent to result in adverse noncarcinogenic health effects is estimated for each receptor by comparing the dose for each COPC with the RfD for that COPC. The resulting ratio, which is unitless, is known as the HQ for that constituent. The target HQ is defined as an HQ of less than or equal to one (USEPA, 1989a). When the HQ is less than or equal to 1, the RfD has not been exceeded, and no adverse noncarcinogenic effects are expected. If the HQ is greater than 1, there may be a potential for adverse noncarcinogenic health effects to occur; however, the magnitude of the HQ cannot be directly equated to a probability or effect level. HQs for a given pathway are summed to provide an HI. Pathway HIs are summed to provide a total receptor HI. When the HI is less than 1, the target has not been exceeded, and no adverse noncarcinogenic effects are expected. This initial HI summation assumes that all the COPCs are additive in their toxicity, and is considered only a screening step as additive toxicity may not be correct. If the HI is greater than 1, further evaluation is necessary to determine if the COPCs are additive in toxicity. This evaluation is termed a toxic endpoint analysis. Any COPC that causes an exceedance of a toxic-endpoint specific HI of 1 was designated a COC.

### Risk Assessment Results

As previously stated, COPCs that significantly contribute to an exceedance of the  $10^{-4}$  risk level are identified as COCs. COPCs that significantly contribute to an exceedance of the target endpoint HI of 1 are also identified as COCs. Table ES-1 presents the COCs by site and receptor. Figure ES-1 indicates the locations of the COCs. COCs were identified for the following areas and receptors:

Site	Receptor
Site O	Outdoor Industrial Worker Construction/Utility Worker
Site O (North)	Outdoor Industrial Worker Construction/Utility Worker Trespassing Teenager
Site Q (North)	Construction/Utility Worker
Site Q (Pond)	Recreational Fisher
Site R	Outdoor Industrial Worker Construction/Utility Worker
Site S	Outdoor Industrial Worker Construction/Utility Worker Trespassing Teenager

Details regarding which COCs were identified for each area/receptor are provided in Table ES-1. The majority of the areas where COCs were identified are not currently used, or are isolated, as described below. Exposure information relevant to the receptors for which COCs were identified is also discussed.

Site O and Site O (North) are located in an isolated area and are not currently used. As discussed in Section 2.3.1, former wastewater treatment lagoons in the area are covered and vegetated, and the vegetation is mowed periodically during the warmer months of the year. Therefore, the potential risks presented above for workers represent the future scenario (the only activity under the current scenario is mowing, which is limited in frequency and duration). The receptor assumptions are extremely conservative for this area, as it is unlikely that an outdoor industrial worker would access the site for 190 days per year. It is also unlikely that construction/utility work would occur in this area for the assumed 40 day period (RME) or 20 day period (MLE). Due to the isolated nature of the site, it is unlikely that trespassers would enter the site as frequently as assumed (26 days RME, 13 days MLE).

A 10-acre site on Site Q (North) is currently used by Rivercity Landscape Supply as a bulk storage terminal for lawn and garden products. Raw landscape products such as mulch, rock and soil are processed and packed on this portion of the site. Access to some portions of the site is restricted by fencing and gates. Other parts of the site have unrestricted access. As noted above, potential risk

exceedances for this area were identified for the construction/utility worker, not for the outdoor industrial worker. Therefore, these are potential risks for a future construction/utility worker, as there is no current excavation work in this area.

Fishing can occur in the Site Q Ponds; however, as noted in Section 2.3.3, fish are only present as a result of flood events. After the ponds dry out, fish are not reintroduced until another flood event, although water may collect in the ponds from precipitation. It is therefore extremely unlikely that a recreational fisher would be able to obtain 22 fish meals per year from the Site Q Ponds, as assumed by the RME scenario.

Site R is a closed industrial-waste disposal area owned by Solutia, Inc. The site is not currently used. Access to Site R is restricted by fencing and is monitored by Solutia plant personnel. Therefore, the potential risks presented above represent the future scenario. It is unlikely that an outdoor industrial worker will access the site 190 days per year in the future. Excavation is not allowed at Site R unless a permit is obtained from the plant and appropriate measures are taken to protect workers undertaking intrusive activities. Therefore, the risk assessment for the construction/utility worker represents a very conservative scenario.

Site S is an unused, 1-acre area. The northern portion of the site is grassed, and its southern portion is covered with gravel and fenced. Therefore, the potential risks presented above for workers represent the future scenario only, and the exposure frequency assumptions are very conservative given the small size of the site. Additionally, due to the fencing of portions of the site and the small size, trespassers are unlikely to access the site frequently.

In summary, several areas of Sauget Area 2 were found to pose risks above the risk management benchmarks. However, it should be noted that numerous conservative assumptions were made in the risk assessment, and actual risks are likely to be lower than predicted in this report.

TABLE ES-1  
SUMMARY OF CONSTITUENTS OF CONCERN (COCs)  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/FS  
SAUGET, ILLINOIS

Site	Receptor	Scenario	COC	Cancer (a) Potential Risk	Non-Cancer (a)		Medium	Pathway	EPC	Units
					HQ	Endpoint				
O	Outdoor Industrial Worker	RME	Xylenes	ND	3.23	Neurological	Combined soil	Inhalation	14000	mg/kg
O	Construction/Utility Worker	RME	Chlorobenzene	ND	1	Liver	Combined soil	Inhalation	760	mg/kg
O	Construction/Utility Worker	RME	Xylenes	ND	14.2	Neurological	Combined soil	Inhalation	14000	mg/kg
O	Construction/Utility Worker	RME	Benzene	NCOC	3.16	Immune	Combined soil	Inhalation	500	mg/kg
O	Construction/Utility Worker	RME	PCBs	NCOC	2.53	Immune, skin, eye	Combined soil	Ingestion/Dermal	298	mg/kg
O North	Outdoor Industrial Worker	RME	PCBs	1.66E-04	11.6	Immune, skin, eye	Surface soil	Ingestion/Dermal	709	mg/kg
O North	Outdoor Industrial Worker	RME	2,3,7,8-TCDD TEQ	4.59E-04	ND	ND	Surface soil	Ingestion/Dermal	0.0508	mg/kg
O North	Outdoor Industrial Worker	RME	Xylenes	ND	1.23	Neurological	Combined soil	Inhalation	3900	mg/kg
O North	Outdoor Industrial Worker	MLE	PCBs	NCOC	7.27	Immune, skin, eye	Surface soil	Ingestion/Dermal	709	mg/kg
O North	Outdoor Industrial Worker	MLE	2,3,7,8-TCDD TEQ	8.32E-05	ND	ND	Surface soil	Ingestion/Dermal	0.0508	mg/kg
O North	Construction/Utility Worker	RME	2,3,7,8-TCDD TEQ	1.15E-04	ND	ND	Combined soil	Ingestion/Dermal	0.0508	mg/kg
O North	Construction/Utility Worker	RME	Xylenes	ND	3.95	Neurological	Combined soil	Inhalation	3900	mg/kg
O North	Construction/Utility Worker	RME	PCBs	NCOC	25.7	Immune, skin, eye	Combined soil	Ingestion/Dermal	3030	mg/kg
O North	Construction/Utility Worker	RME	PCBs	NCOC	2.81	Immune, skin, eye	Leachate	Ingestion/Dermal	0.055	mg/L
O North	Construction/Utility Worker	MLE	PCBs	NCOC	5.48	Immune, skin, eye	Combined soil	Ingestion/Dermal	1780	mg/kg
O North	Construction/Utility Worker	MLE	PCBs	NCOC	1.4	Immune, skin, eye	Leachate	Ingestion/Dermal	0.055	mg/L
O North	Trespassing Teenager	RME	PCBs	NCOC	4.86	Immune, skin, eye	Surface soil	Ingestion/Dermal	709	mg/kg
O North	Trespassing Teenager	RME	2,3,7,8-TCDD TEQ	8.62E-05	ND	ND	Surface soil	Ingestion/Dermal	0.0508	mg/kg
O North	Trespassing Teenager	MLE	PCBs	NCOC	1.33	Immune, skin, eye	Surface soil	Ingestion/Dermal	709	mg/kg
Q North	Construction/Utility Worker	RME	2,4,6-Trichlorophenol	NCOC	8.43	Reproductive	Leachate	Ingestion/Dermal	12.5	mg/L
Q North	Construction/Utility Worker	RME	2,4-Dichlorophenol	ND	1.82	Immune	Leachate	Ingestion/Dermal	170	mg/L
Q North	Construction/Utility Worker	MLE	2,4,6-Trichlorophenol	NCOC	4.21	Reproductive	Leachate	Ingestion/Dermal	12.5	mg/L
Q North	Construction/Utility Worker	MLE	2,4-Dichlorophenol	ND	0.907	Immune	Leachate	Ingestion/Dermal	170	mg/L
Q Pond	Recreational Fisher	RME	PCBs	3.79E-04	22.1	Immune, skin, eye	Black bullhead fillet	Ingestion	3.87	mg/kg
Q Pond	Recreational Fisher	RME	Dieldrin	7.84E-05	NCOC	NCOC	Black bullhead fillet	Ingestion	0.1	mg/kg
Q Pond	Recreational Fisher	MLE	PCBs	NCOC	2.76	Immune, skin, eye	Black bullhead fillet	Ingestion	3.87	mg/kg
Q Pond	Recreational Fisher	RME	PCBs	9.80E-04	57.1	Immune, skin, eye	Carp fillet	Ingestion	10	mg/kg
Q Pond	Recreational Fisher	RME	Dieldrin	1.49E-04	NCOC	NCOC	Carp fillet	Ingestion	0.19	mg/kg
Q Pond	Recreational Fisher	RME	2,3,7,8-TCDD TEQ	1.35E-04	ND	ND	Carp fillet	Ingestion	1.84E-05	mg/kg
Q Pond	Recreational Fisher	RME	Benzo(a)pyrene	6.44E-05	ND	ND	Carp fillet	Ingestion	0.18	mg/kg
Q Pond	Recreational Fisher	RME	Arsenic	6.02E-05	NCOC	NCOC	Carp fillet	Ingestion	0.82	mg/kg
Q Pond	Recreational Fisher	MLE	PCBs	NCOC	7.14	Immune, skin, eye	Carp fillet	Ingestion	10	mg/kg
R	Outdoor Industrial Worker	RME	Trichloroethylene	6.12E-04	NCOC	NCOC	Combined soil	Inhalation	2200	mg/kg
R	Outdoor Industrial Worker	RME	Trichloroethylene	6.93E-04	NCOC	NCOC	Leachate	Inhalation	150	mg/L
R	Outdoor Industrial Worker	MLE	Trichloroethylene	1.34E-04	NCOC	NCOC	Leachate	Inhalation	150	mg/L
R	Construction/Utility Worker	RME	Trichloroethylene	4.33E-05	1.22	Liver	Combined soil	Ingestion/Dermal	2200	mg/kg
R	Construction/Utility Worker	RME	Trichloroethylene	7.13E-04	14.43	Liver, Neurological	Leachate	Ingestion/Dermal/Inhalation	150	mg/L
R	Construction/Utility Worker	RME	PCBs	1.17E-04	204	Immune, skin, eye	Leachate	Ingestion/Dermal	3.98	mg/L
R	Construction/Utility Worker	RME	1,2-Dichloroethane	5.54E-05	8.42	Liver, kidney, GI, and skin	Leachate	Inhalation	50	mg/L
R	Construction/Utility Worker	RME	Mercury	ND	0.747	Immune	Combined soil	Ingestion/Dermal	699	mg/kg
R	Construction/Utility Worker	MLE	Trichloroethylene	2.19E-04	5.76	Liver	Leachate	Inhalation	150	mg/L
R	Construction/Utility Worker	MLE	PCBs	NCOC	102	Immune, skin, eye	Leachate	Ingestion/Dermal	3.98	mg/L
R	Construction/Utility Worker	MLE	1,2-Dichloroethane	NCOC	2.53	Liver, kidney, GI, and skin	Leachate	Inhalation	50	mg/L

TABLE ES-1  
SUMMARY OF CONSTITUENTS OF CONCERN (COCs)  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Site	Receptor	Scenario	COC	Cancer (a) Potential Risk	Non-Cancer (a)		Medium	Pathway	EPC	Units
					HQ	Endpoint				
S	Outdoor Industrial Worker	RME	PCBs	2.37E-04	16.6	Immune, skin, eye	Surface soil	Ingestion/Dermal	1010	mg/kg
S	Outdoor Industrial Worker	MLE	PCBs	NCOC	5.17	Immune, skin, eye	Surface soil	Ingestion/Dermal	504	mg/kg
S	Construction/Utility Worker	RME	PCBs	NCOC	8.56	Immune, skin, eye	Combined soil	Ingestion/Dermal	1010	mg/kg
S	Trespassing Teenager	RME	PCBs	NCOC	6.91	Immune, skin, eye	Surface soil	Ingestion/Dermal	1010	mg/kg
Notes EPC - Exposure point concentration GI - Gastrointestinal HQ - Hazard Quotient MLE - Most Likely Exposure NCOC - Not a constituent of concern via this pathway ND - No Dose-Response value for this pathway PCBs - Polychlorinated Biphenyls RME - Reasonable Maximum Exposure TCDD-TEQ - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration (a) - Only constituents driving a risk exceedance are presented on this table										





## 1.0 INTRODUCTION

This report presents the baseline human health risk assessment (HHRA) for Sauget Area 2, located in Sauget and Cahokia, Illinois. On November 20, 2000, the Sauget Area 2 Sites Group (SA2SG) Potential Responsible Parties (PRPs) signed an Administrative Order on Consent (AOC), Docket Number V-W-01-C-622, to perform a Remedial Investigation/Feasibility Study (RI/FS) at Sauget Area 2 Sites O, P, Q, R, and S. The United States Environmental Protection Agency (USEPA) signed the AOC on November 24, 2000. This HHRA is submitted to partially fulfill the requirements of Section V.2. of the AOC, and of Section 2.6 of Task 3 of the Scope of Work (SOW) presented as Attachment B of the AOC. The HHRA was conducted to satisfy the AOC, as well as to be compliant with the National Contingency Plan (NCP) (USEPA, 1990).

The HHRA was conducted in accordance with the USEPA-approved Human Health Risk Assessment Workplan (HHRA Workplan) dated May 25, 2001 (including September 2001 and May 2002 revised pages), which was submitted as Section 11 of Volume 1 of the Support Sampling Plan (SSP) for Sauget Area 2 (URS, 2001). The HHRA Workplan is provided as Appendix A to this report.

The HHRA was conducted using data from environmental samples collected from the study area in accordance with the USEPA-approved SSP. Validated laboratory analytical data are compiled in the Data Validation Report (URS, 2003a), and field data are compiled in the Field Sampling Report (URS, 2003b). In addition, data from fish fillet samples from the Mississippi River collected by Menzie-Cura (2001), in accordance with a USEPA-approved workplan, were evaluated in the HHRA.

### Baseline Risk Assessment

The purpose of the baseline HHRA is to evaluate potential human health effects of chronic exposures to constituents detected in samples of environmental media collected from the study area.

The HHRA was conducted to be consistent with USEPA guidance for conducting a risk assessment including, but not limited to, the following:

- Risk Assessment Guidance for Superfund (RAGS): Volume 1 - Human Health Evaluation Manual (Parts A and D) (USEPA, 1989a and 1998a).
- Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions (USEPA, 1991a).
- USEPA Soil Screening Guidance: User's Guidance Manual, and Technical Background Document (USEPA, 1996a,b).

- Human Health Evaluation Manual Supplemental Guidance; Standard Default Exposure Factors. OSWER Directive 9285.6-03 (USEPA, 1991b).
- Exposure Factors Handbook (USEPA, 1997a).
- Land Use in CERCLA Remedy Selection Process. OSWER Directive No. 9355.7-04 (USEPA, 1995a).

In addition, elements of the Illinois Environmental Protection Agency (IEPA) Tiered Approach to Corrective Action Objectives (TACO) (IEPA, 2002b) were used in the conduct of the HHRA.

The baseline HHRA has been conducted in accordance with the four-step paradigm for human health risk assessments developed by USEPA (USEPA, 1989a); these steps are:

- Data Evaluation and Hazard Identification
- Toxicity Assessment
- Exposure Assessment
- Risk Characterization

### Report Organization

A summary of the information presented in each section of the report is as follows.

- Section 2.0 – Site Characterization. This section discusses the site and its environs, describes source areas, potential migration pathways, and potentially impacted media.
- Section 3.0 – Data Evaluation and Hazard Identification. This section presents a summary of the site data for use in the HHRA, and the results of the process used for the selection of constituents of potential concern (COPCs) to be quantitatively evaluated in the baseline HHRA.
- Section 4.0 – Dose-Response Assessment. The dose-response assessment evaluates the relationship between the magnitude of exposure (dose) and the potential for occurrence of specific health effects (response) for each COPC. Both potential carcinogenic and noncarcinogenic effects are considered. This section presents the quantitative dose-response values used in the baseline HHRA. The most current USEPA verified dose-response values are used when available.
- Section 5.0 – Exposure Assessment. The purpose of the exposure assessment is to provide a quantitative estimate of the magnitude and frequency of potential exposure to COPCs by a receptor. This section presents the updated conceptual site model (CSM) originally

presented in the HHRA Workplan. Potentially exposed individuals, and the pathways through which those individuals may be exposed to COPCs are identified based on the physical characteristics of the site, as well as the current and reasonably foreseeable future uses of the site and surrounding area. The extent of a receptor's exposure is estimated by constructing exposure scenarios that describe the potential pathways of exposure to COPCs and the activities and behaviors of individuals that might lead to contact with COPCs in the environment.

- **Section 6.0 – Risk Characterization.** Risk characterization combines the results of the exposure assessment and the toxicity assessment to derive site-specific estimates of potentially carcinogenic and noncarcinogenic risks resulting from both current and reasonably foreseeable future potential human exposures to COPCs. The results of the risk characterization are used to identify constituents of concern (COCs), which are a subset of those COPCs whose risks result in an exceedance of the target risk range of  $1 \times 10^{-6}$  to  $1 \times 10^{-4}$  for potential carcinogens and an exceedance of a target Hazard Index of 1 for noncarcinogens (that act on the same target organ), as defined in USEPA guidance (USEPA, 1991a), and by IEPA (2002b). The target risk levels used for the identification of COCs are based on USEPA guidance and Illinois TACO guidance. Specifically, USEPA provides the following guidance (USEPA, 1991a):

“Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than  $10^{-4}$ , and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts.” and,

“The upper boundary of the risk range is not a discrete line at  $1 \times 10^{-4}$ , although EPA generally uses  $1 \times 10^{-4}$  in making risk management decisions. A specific risk estimate around  $10^{-4}$  may be considered acceptable if justified based on site-specific conditions.”

IEPA provides the following summary for the evaluation of cumulative risk for carcinogens (IEPA, 2002b, Fact Sheet 13: Mixture Rule):

“The cumulative risk of carcinogenic contaminants attacking the same target must not exceed 1 in 10,000 [ $10^{-4}$ ]. Therefore, the risk from all on-site similar acting carcinogens must be added together. If this cumulative risk level is greater than 1 in 10,000, corrective action must be taken to reach an acceptable risk level.”

Within any of the steps of the risk evaluation process described above, assumptions must be made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. The assumptions that introduce the greatest amount of uncertainty in this risk evaluation are discussed in Section 6.0.

- Section 7.0 – Summary and Conclusions. This section presents a summary of the results of the baseline HHRA.
- Section 8.0 – This section presents the references used in the text.

Tables and figures follow each section.



## 2.0 SITE CHARACTERIZATION

This HHRA addresses data from environmental samples collected in accordance with the SSP (URS, 2001) from the areas of Sauget Area 2 identified in the AOC. Specifically, the HHRA for Sauget Area 2 addresses waste, soil, groundwater, leachate, surface water, sediment, fish fillet, and air in the following areas:

- Sites O, P, Q, R and S, and
- Mississippi River adjacent to the Sites

As discussed in Sections 1.0 and 2.0 of the SSP (URS, 2001), Sites O, P, Q, R, and S contain wastes that came from a wide variety of municipal and industrial sources. The sites are bounded to the west by the Mississippi River and to the north, east and south by industrial and commercial properties.

### 2.1 Study Area Description

Figure 2-1 presents the study area addressed by the RI/FS.

The Sauget Area 2 Sites are located in the City of East St. Louis and the Villages of Sauget and Cahokia in St. Clair County, Illinois. The Sauget Area 2 study area is east of the Mississippi River and south of the MacArthur bridge railroad tracks. The study area is west of Route 3 (Mississippi Avenue) and north of Cargill Road.

<u>Sites</u>	<u>Former Use</u>	<u>Municipality</u>
Site O	Sewage Sludge Dewatering	Village of Sauget
Site P	Municipal and Industrial Waste Disposal	City of East St. Louis Village of Sauget
Site Q	Municipal and Industrial Waste Disposal	Village of Sauget Village of Cahokia
Site R	Industrial Waste Disposal	Village of Sauget
Site S	Chemical Reprocessing Waste Disposal	Village of Sauget

These sites are located in an area historically used for heavy industry, including chemical manufacturing, metal refining and power generation, and waste disposal. Currently the area is used for

heavy industry, warehousing, bulk storage (coal, refined petroleum, lawn and garden products and grain), waste water treatment, hazardous waste treatment, waste recycling and truck terminals. Four commercial establishments are located at the north end of the study area. No residences are located within the study area. Residential areas closest to Sauget Area 2 are approximately 3,000 feet east of Site P and about 3,000 feet east of Site O. These residential areas are located, respectively, in East St. Louis and Cahokia.

Groundwater is not used as a source of drinking water in the area. Both the Village of Sauget and the Village of Cahokia have in effect ordinances that prohibit the use of groundwater as a potable water supply. Copies of these ordinances are presented in Appendix P.

## **2.2 Sites Location and Physical Setting**

The Sauget Area 2 Sites are located in the floodplain of the Mississippi River in an area known as American Bottoms. Topographically, the area consists primarily of flat bottom land, although local topographic irregularities do occur. Generally, land surface in the American Bottoms slopes from north to south and from east to west toward the Mississippi River. Land surface elevation ranges from 400 to 410 feet above Mean Sea Level (MSL) with little topographic relief. Sauget Area 2 consists of five former disposal areas, Sites O, P, Q, R and S, adjacent, or in close proximity, to the Mississippi River. These five disposal areas were given letter designations by the Illinois Environmental Protection Agency (IEPA) in the 1980s. Two of these sites, Sites Q and R, are located on the wet side of the floodwall and levee which is operated and maintained by the United States Army Corps of Engineers (USACE) and the Metro East Sanitary District. The floodwall is designed to protect the City of East St. Louis and the Villages of Sauget and Cahokia from flooding. Sites O, P and S are located on the dry side of the floodwall and levee.

## **2.3 Site Descriptions**

Complete site descriptions are provided in the SSP (URS, 2001). Descriptions of the sites that are germane to the HHRA are included below.

### **2.3.1 Site O**

Site O, located on Mobile Avenue in Sauget, Illinois, occupies approximately 20 acres of land to the northeast of the American Bottoms Regional Wastewater Treatment Facility (ABRTF). An access road to the ABRTF runs across the middle of the site. In 1952, the Village of Sauget Waste Water Treatment Plant began operation at this location. Four lagoons were constructed at the wastewater treatment plant in 1965 and placed in operation in 1966/1967. The lagoons were closed in 1980 by stabilizing the sludge with lime and covering it with approximately two feet of clean low permeability soil. Currently, the lagoons are covered with clean low-permeability soil and are vegetated.

As a result of a review of historical aerial photographs and trenching work conducted as part of the SSP field program, two additional areas were added to Site O: an approximately 3-acre area adjacent to the northeast side of Site O, and an approximately 4-acre area adjacent to the southwest side of Site O (see Figure 2-1).

Based on site characteristics and a review of the analytical data for Site O, for the purposes of the HHRA, the approximately 3-acre area adjacent to the northeast side of Site O has been identified separately as Site O (North) (see Figure 2-1).

#### Current Use

As noted above, an access road to the ABRTF runs across the middle of the site. The site is located in an isolated area and is not currently used. The former lagoons are covered and vegetated, and the vegetation is mowed periodically during the warmer months of the year.

### **2.3.2 Site P**

Site P, which is bounded by the Illinois Central Gulf Railroad tracks, the Terminal Railroad Association tracks and Monsanto Avenue, occupies approximately 20 acres of land located in the City of East St. Louis and the Village of Sauget.

#### Current Use

Site P is currently inactive and partially covered with an asphalt parking lot. Access to the site is not restricted. Currently, PT's Showclub is located on the southeastern corner of Site P, along Monsanto Avenue.

### **2.3.3 Site Q**

Site Q is a former subsurface and surface disposal area in the Villages of Sauget and Cahokia. Based on site characteristics, including topography, evaluation of historical aerial photos and results of the magnetometer and other studies conducted as part of the SSP field program, Site Q was divided into four areas for the purposes of site characterization and risk evaluation: Site Q (North), Site Q (Central), Site Q (South), and Site Q Ponds. Refer to Figure 2-1 for delineation.

Site Q is on the west or river side of the USACE floodwall. At the time of the development of the SSP work plan, there were two ephemeral ponded areas in the southern portion of Site Q. However, by the time the field sampling occurred (summer of 2002), one of these ponded areas contained water and fish, and the other ponded area was dry. Both ponded areas were dry in the spring of 2003. In the summer of 2003, water had collected in these two areas as a result of heavy precipitation. It is

understood that flooding from the Mississippi River is responsible for bringing fish into the ponds. Based on these characteristics, Site Q Ponds are evaluated as a separate area in the HHRA (see Figure 2-1)

#### Current Use

Site Q (North) is covered with gravel, while Site Q (Central) is covered with highly permeable black cinders, and Site Q (South) is vegetated. Eagle Marine Industries and Peavy Company, a division of ConAgra, operate barge terminal facilities in the central part of the northern portion of Site Q. The southern portion of Site Q is used for reclaiming rebar from concrete. A 10-acre site on the northern portion of Site Q is currently used by Rivercity Landscape Supply as a bulk storage terminal for lawn and garden products. Raw landscape products such as mulch, rock and soil are processed and packed on this portion of the site. Access to some portions of the site is restricted by fencing and gates. Other parts of the site have unrestricted access.

Fishing can occur in the Site Q Ponds, however, as noted above, fish are only present as a result of flood events. After the ponds dry out, fish are not reintroduced until another flood event, although water may collect in the ponds from precipitation.

#### **2.3.4 Site R**

Site R, a closed industrial-waste disposal area owned by Solutia, Inc., is located between the flood control levee and the Mississippi River in Sauget, Illinois. Its northern border is Monsanto Avenue and its southern border is Site Q. A portion of Site Q, known as the "Dog Leg," part of Site Q (North), is located to the east of Site R. Site R occupies approximately 24 acres.

In 1979, Monsanto completed the installation of a clay cover on Site R to cover waste, limit infiltration through the landfill, and prevent direct contact with fill material. The cover's thickness ranges from 2 feet to approximately 8 feet. In 1985, Monsanto installed a 2,250-foot long rock revetment along the east bank of the Mississippi River adjacent to Site R. The purpose of the stabilization project was to prevent further erosion of the riverbank and thereby minimize potential for the surficial release of waste material from the landfill. During the 1993 flood, the clay cap on Site R was not overtopped. No erosion of the river bank or cap resulted from this flood.

#### Current Use

The site is not currently used. Access to Site R is restricted by fencing and is monitored by Solutia plant personnel.

### **2.3.5 Site S**

Site S is located southwest of Site O and occupies approximately 1 acre

#### Current Use

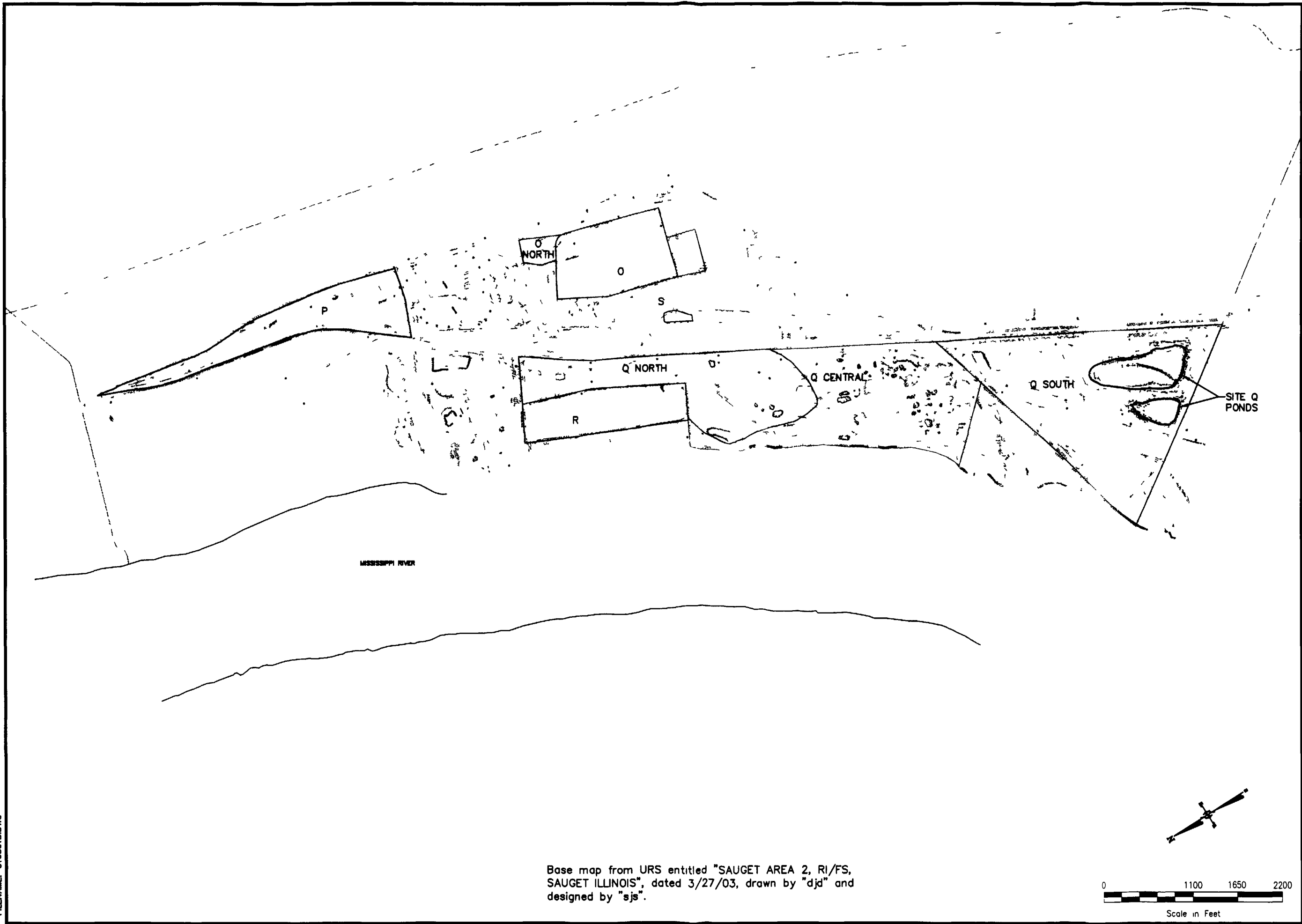
The site is currently not used. The northern portion of the site is grassed, and its southern portion is covered with gravel and fenced.

### **2.4 Conceptual Site Model**

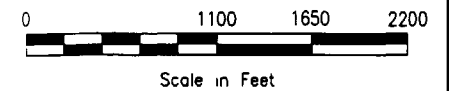
To guide identification of appropriate exposure pathways for evaluation in the risk assessment, a CSM for human health was developed. The purpose of the CSM is to identify source areas, potential migration pathways of constituents from source areas to environmental media where exposure can occur, and to identify potential human receptors. The CSM is meant to be a "living" model that can be updated and modified as additional data become available.

The initial CSM for the site is presented in Figure 11-1 of the HHRA Workplan presented in Appendix A and was used to guide the investigation presented in the SSP and the COPC selection process in Section 3.0. An updated CSM is presented in Section 5.0 (Exposure Assessment), based on the data evaluation and COPC selection conducted in Section 3.0. The updated CSM provides the basis for the exposure scenarios evaluated in the HHRA.

FILENAME: 810501B.DWG



Base map from URS entitled "SAUGET AREA 2, RI/FS, SAUGET ILLINOIS", dated 3/27/03, drawn by "djd" and designed by "sjs".



DESIGNED BY:		REVISIONS	
KS		NO.	DATE
DRAWN BY:		DESCRIPTION	
BLB			
CHECKED BY:			
KS			
APPROVED BY:			
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STUDY AREA HUMAN HEALTH RISK ASSESSMENT SAUGET AREA 2 RI/FS SAUGET, IL		
SCALE: 1"=1100'	DATE: 7/03	PROJECT NUMBER: 06105-009

FIGURE NUMBER: <b>2-1</b>
SHEET NUMBER: X



### **3.0 DATA EVALUATION AND HAZARD IDENTIFICATION**

The purpose of the data evaluation and hazard identification process is two-fold: 1) to evaluate the nature and extent of release of constituents present at the site; and 2) to select a subset of these constituents identified as COPCs for quantitative evaluation in the risk assessment. This step of the risk assessment involves compiling and summarizing the data for the risk assessment, and selecting COPCs based on a series of screening steps.

#### **3.1 Data Evaluation**

The HHRA was conducted using validated data collected from the site in support of the SSP. Data used in the HHRA are presented in the Data Validation Report (URS, 2003a) and the Field Sampling Report (URS, 2003b).

##### **3.1.1 Areas and Media**

The SSP for Sauget Area 2 was designed to investigate two major areas of the Sauget Area 2 study area:

- Sites O, P, Q, R and S; and
- Mississippi River adjacent to Sites.

The sites are being evaluated in the HHRA as follows:

- Site O
- Site O (North)
- Site P
- Site Q
  - Site Q (North)
  - Site Q (Central)
  - Site Q (South)
  - Site Q Ponds
- Site R
- Site S

Of the data collected in support of the SSP, analytical data for use in the HHRA are available for the following media:

- Site waste;
- Site surface soil (0.5 feet below ground surface (bgs));
- Site subsurface soil (6 feet bgs);
- Site leachate;
- Site groundwater;
- Site Q Pond surface water;
- Site Q Pond sediment;
- Site Q Pond fish fillet; and
- Mississippi River surface water;
- Mississippi River sediment;
- Mississippi River fish fillet;
- 24-hour ambient air samples collected in the vicinity of Sites P, Q, and R/O/S.

Analytical data for use in the HHRA from background or off-site reference locations are available for the following media:

- Surface soil;
- Subsurface soil;
- Groundwater;
- Upgradient surface water; and
- Upgradient sediment.

Figure 3-1 shows the study area and the sample collection locations for soil, waste, groundwater, leachate, surface water, sediment, and fish.

### **3.1.2 Analytes**

The SSP identified the suites of analytes for each medium. The full suite of analytes included in the risk assessment are identified as follows:

- Volatile organic compounds (VOCs);
- Semi-volatile organic compounds (SVOCs);
- Pesticides;
- Herbicides;
- Polychlorinated biphenyls (PCBs);
- Metals; and
- Dioxins and furans (referred to as Dioxin-TEQ).

All analytical data collected in support of the SSP were compiled and tabulated in a database for statistical analysis. These data are presented in the Data Validation Report (URS, 2003a).

Note that not all samples were analyzed for all analytes, per the USEPA-approved SSP. The exceptions are:

- Fish fillets were not analyzed for VOCs; these constituents are not expected to bioaccumulate, and the VOCs would be lost during sample preparation.
- Dioxins and furans were analyzed in the majority of samples, but not in all samples.

### **3.1.3 Sample Collection and Data Evaluation by Area and Medium**

Data sets for each medium are described below. Figure 3-1 shows sample locations for the study area. Figure 3-2 shows the Mississippi River fish fillet sample locations.

#### **3.1.3.1 Waste**

Figure 3-3 identifies the location of each waste sample for each site. Note that soil and waste samples were collected from the same locations; therefore, both soil and waste locations are designated as described above on Figure 3-3 as W-site-location (e.g., W-P-1). Discrete samples were collected from various depths within the waste and analyzed for dioxins and furans and VOCs. Composite samples were collected from the top of the waste to the bottom of the waste and analyzed for metals, PCBs, pesticides, herbicides, and metals. These samples were also analyzed using the Toxicity Characteristic Leaching Procedure (TCLP). The site waste sample identification numbers have the following format: medium -- site -- location -- depth (or COMP for composite samples), e.g., Waste-P-1-4FT or Waste-P-1-COMP, which would have been collected at location W-P-1. TCLP samples have a "T" appended to the end of the sample identification number.

The waste samples are used in the evaluation of potential construction activities, which are assumed to occur to a depth of 15 feet bgs. If waste occurred at a depth interval wholly below a depth of 15 feet bgs, then the analytical data from the waste samples were not included for evaluation. If the waste interval started anywhere within the 0-15 feet bgs interval, then all of the waste analytical data, both composite and discrete samples, were included in the evaluation. Note that many of the discrete waste samples were collected below this range, where construction activities are not assumed to occur. However, because the composite samples were collected across the entire waste horizon, the discrete waste samples collected below 15 feet bgs are included in the HHRA as they represent potential concentrations of constituents in the waste. The TCLP samples are used in the evaluation of the potential soil-to-groundwater pathway, but are not used in the quantitative HHRA. Table B-1 of Appendix B identifies the waste samples evaluated in the HHRA.

### **3.1.3.2 Soil**

Figure 3-3 identifies the location of each soil sample for each site. Note that soil and waste samples were collected from the same locations, therefore, both soil and waste locations have the same location identifier, following the X-Y-Z format. "X" identifies the type of sample, here "W" is used for waste/soil boring. "Y" identifies the site, and "Z" identifies the location number. Surface soil (0-5 feet bgs) and subsurface soil (6 feet bgs) samples were collected at each location. These samples were analyzed for the full suite of analytes and dioxins and furans. The site soil sample identification numbers have the following format: medium -- site -- location -- depth, e.g., SOIL-P-1-0.5, and that sample would have been collected at location W-P-1. Table B-1 of Appendix B identifies the soil samples evaluated in the HHRA.

### **3.1.3.3 Leachate**

A leachate well was installed in each of Site O (North), P, Site Q (North), Site Q (Central), Site Q (South), R, and S. Leachate did not collect in the wells in P, Site Q (Central), Site Q (South) and S. However, leachate samples were collected and analyzed from Site O (North), Site Q (North), and R. These data are treated as shallow groundwater in the HHRA. Leachate well locations are indicated on Figure 3-4. The location identifiers follow the same X-Y-Z format. "X" identifies the type of sample location, in this case "L" for leachate well. "Y" identifies the site and "Z" identifies the sample location number. Table B-1 of Appendix B identifies the leachate samples evaluated in the HHRA.

### **3.1.3.4 Groundwater**

Figure 3-4 identifies the groundwater sample locations evaluated in the risk assessment. Groundwater sample locations have a 3-part identifier: X-Y-Z. "X" identifies the type of sample location, where AA or BDRK are used for samples screened in the alluvial aquifer or bedrock, respectively. "Y" identifies

the site, e.g., P through S, and "Z" identifies the location number (e.g., AA-P-1). The piezometer locations ("PIEZ") were used only to measure groundwater elevations.

For the purposes of the risk assessment, shallow groundwater is defined as groundwater that is encountered within 15 feet bgs, and shallow/mid groundwater is defined as groundwater that is encountered within 30 feet bgs, as noted in the workplan. These depth intervals have been selected based on potential construction activities, which may occur up to 15 feet bgs, and potential for volatilization to indoor and/or outdoor air (groundwater present up to 30 feet bgs), as discussed more fully in Section 5.0.

Samples were collected from the alluvial aquifer using direct push technology. Samples were collected every 10 feet. The sample identifier appends a depth designation to the sample location (e.g., AA-P-1-20FT). The full suite of analytes were analyzed in the most shallow sample collected at each location. The analytes evaluated at the deeper samples followed the program outlined in Section 7 of the SSP (URS, 2001).

The first sample at each alluvial aquifer location was generally collected within 5 feet of encountering groundwater. To estimate the depth from the ground surface to groundwater, 5 feet is subtracted from the depth identified in the sample identification for the most shallow groundwater sample. Therefore, all samples collected to a depth of 20 feet have been defined as shallow (20 feet sample depth - 5 feet = 15 feet to groundwater), while samples collected from between 21 and 35 feet have been defined as shallow/mid depth. Samples collected from greater than 35 feet have been defined as deep. Deep groundwater samples are not included in the quantitative human health risk assessment; however, a separate comparison of deep groundwater concentrations to screening levels is included in Appendix F.

Groundwater present up to 30 feet bgs is included for evaluation of the volatilization to indoor/outdoor air pathway. However, the most shallow sample within that depth interval at a given location is used as the source term for modeling to indoor/outdoor air. Note that samples falling into the mid-depth category that have a corresponding sample collected from a more shallow depth have been defined as deep, such that the most shallow data-point collected from each location is used to evaluate potential volatilization from groundwater to air.

Table B-1 of Appendix B identifies the shallow/mid-groundwater samples evaluated in the HHRA.

### **3.1.3.5 Surface Water**

Surface water sample locations included in the risk assessment are identified on Figure 3-5.

Per the SSP, surface water samples were analyzed for the full suite of analytes, with the exception that only a subset were analyzed for dioxins and furans. Surface water samples with a sample identifier beginning with an "R" were collected from the Mississippi River, while those beginning with a "P" were collected from the Site Q Pond. Table B-1 of Appendix B identifies the surface water samples evaluated in the HHRA.

#### **3.1.3.6 Sediment**

Sediment sample locations included in the risk assessment are identified on Figure 3-5.

Per the SSP, sediment samples were analyzed for the full suite of analytes, with the exception that only a subset was analyzed for dioxins and furans. Sediment samples with a sample identifier beginning with an "R" were collected from the Mississippi River, while the sample beginning with a "P" was collected from the Site Q Pond. Table B-1 of Appendix B identifies the sediment samples evaluated in the HHRA.

#### **3.1.3.7 Fish**

Fish samples of both whole body and fillet were submitted for analysis. Per the USEPA-approved workplan, only fillet data are used in the HHRA, as these data are more representative of potential human fish consumption exposures. Whole body fish data are evaluated in the ecological risk assessment. Fish fillet samples were analyzed for the full suite of analytes (with the exception of VOCs).

Fish fillet samples were collected as part of the SSP program from the Site Q Pond in November 2002. A sample of carp fillet and a sample of black bullhead fillet are available from the Site Q Pond. This location is indicated in Figure 3-5.

Fish fillet samples from the Mississippi River were collected by Menzie-Cura and Associates in October-November 2000 at the following locations (Menzie-Cura, 2001) (see Figure 3-2):

- the Plume Discharge Area (PDA) located adjacent to Site R;
- the Upstream of the Discharge Area (UDA) located upstream of the study area; and
- the Downstream of the Discharge Area (DDA) located downstream of the study area.

One buffalo fish fillet sample is available from the UDA and DDA, and three samples of buffalo fish fillet are available from the PDA. Table B-1 of Appendix B identifies the fish fillet samples evaluated in the HHRA.

### 3.1.3.8 Ambient Air

Ambient air sample locations are indicated on Figure 3-6.

Ambient air samples were collected in the vicinity of Sites P, Q, and R/O/S and analyzed for VOCs, SVOCs, pesticides, PCBs, dioxins and furans, and metals. Air samples were collected over a 24-hour period during hot, dry conditions (August, 2002) conducive to air emissions of dust and volatiles. These data are compared to chronic screening levels as discussed in the HHRA Workplan (Appendix A). However, due to the one-time sample collection, these data are not quantitatively evaluated in the HHRA. As noted in the HHRA Workplan, the air pathway is addressed in the HHRA by modeling potential sources in soil, waste and groundwater (see Section 5.0). Appendix G presents the ambient air data screen and results.

### 3.1.4 Summary Statistics

The data for each area and medium included in the quantitative HHRA were summarized for use in the risk assessment. The following guidance documents were used to develop the summary statistics:

- Risk Assessment Guidance for Superfund: Volume I – Human Health Evaluation Manual, Part A (USEPA, 1989a).
- Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites (USEPA, 2002a).

The steps used to summarize the data by area and medium for use in identifying COPCs in the screening process presented in this section are discussed here. The additional steps used to summarize the data for identifying exposure point concentrations (EPCs) are presented in Section 5.0.

The sequential steps used to summarize the data by area and medium are as follows:

Treatment of Duplicates: Data for samples and their duplicates were averaged before summary statistics were calculated, such that a sample and its duplicate were treated as one sample for calculation of summary statistics (including maximum detection and frequency of detection).

Treatment of Non-Detects:

- Summary statistics were not calculated for constituents that were not detected in a particular area/medium.

- Where constituents were detected in some samples and not in others in a particular area/medium,  $\frac{1}{2}$  the reported sample quantitation limit (SQL) was used as a proxy concentration for the samples reported as nondetect (USEPA, 1989a).
- For all non-detects for which  $\frac{1}{2}$  the SQL was calculated,  $\frac{1}{2}$  the SQL was compared to the maximum detected concentration for that area and medium. Where  $\frac{1}{2}$  the SQL was greater than the maximum detected concentration in a particular area/medium, the SQL value was not used in the calculation of summary statistics for that constituent in that area and medium (USEPA, 1989a). Due to the sample size, a more statistical method to evaluate results reported as not detected was not used in this HHRA.

Frequency of Detection: The frequency of detection is reported as a ratio and a percentage based on the total number of samples analyzed and the number of samples reported as detected for a specific constituent. The number of samples used to calculate statistics reflects the treatment of non-detects described above.

Maximum Detected Concentration: This is the maximum detected concentration for each constituent/area/medium combination, after duplicates have been averaged.

Average Concentration: This is the arithmetic mean concentration for each constituent/area/medium combination, after duplicates have been averaged and non-detects have been evaluated.

Appendix B presents the summary statistics for each area and medium to be quantitatively evaluated in the HHRA. The tables also present the screening described in Section 3.2. The appendix is organized as follows:

- Table B-1 - samples used in the calculation of summary statistics for each area and medium;
- Table B-2 - summary statistics and screening for groundwater (depth to water less than or equal to 30 feet below ground surface) and leachate;
- Table B-3 - summary statistics and screening for surface soil;
- Table B-4 - summary statistics and screening for combined soil (for the construction pathway, surface soil, subsurface soil, and waste were combined to evaluate the 0-15 foot bgs soil column interval);
- Table B-5 - summary statistics and screening for sediment;
- Table B-6 - summary statistics and screening for surface water; and
- Table B-7 - summary statistics and screening for fish fillet.

### **3.2 Methodology for Selection of Constituents of Potential Concern**

COPCs are a subset of the complete list of constituents detected in site media that are carried through the quantitative risk assessment process. Selection of COPCs focuses the analysis on the most likely risk “drivers.” As stated in USEPA guidance (USEPA, 1993a):

“Most risk assessments are dominated by a few compounds and a few routes of exposure. Inclusion of all detected compounds at a site in the risk assessment has minimal influence on the total risk. Moreover, quantitative risk calculations using data from environmental media that may contain compounds present at concentrations too low to adversely affect public health have no effect on the overall risk estimate for the site. The use of a toxicity screen allows the risk assessment to focus on the compounds and media that may make significant contributions to overall risk.”

Several factors are typically considered in selecting COPCs for a site, including background/upgradient concentrations, frequency of detection, toxicity, and essential nutrient status. Each of these evaluation steps is called a “screening step.” Risk calculations are conducted using the COPCs identified in these steps.

The steps used to identify COPCs are presented below.

#### **3.2.1 Evaluation of Frequency of Detection and Essential Nutrient Status**

Per the HHRA Workplan (Appendix A), a frequency of detection screen was conducted on each medium (e.g., sediment, surface soil, etc.). Any constituent detected in fewer than 5% of samples, provided 20 samples are available, can be eliminated as COPCs. However, based on the frequency of detection information presented in the summary statistics/screening tables in Appendix B, no constituents were excluded from consideration as a COPC based on the frequency of detection screen with the exception of three constituents each detected in one of 36 samples in Mississippi River surface water (2,4,6-trichlorophenol, 2,6-dinitrophenol, and pentachlorophenol). Essential nutrients (i.e., calcium, iron, magnesium, sodium and potassium) were not included as COPCs (HHRA Workplan [Appendix A], and USEPA, 1989a).

#### **3.2.2 Comparison to Background/Upgradient Data**

Background/upgradient samples were collected in the vicinity of the site to provide information on levels of constituents typical for the local area. The purpose of comparing site conditions to local background is to determine if site concentrations of constituents are representative of background concentrations, i.e., do not represent a release at the site and should, therefore, not be included in risk

calculations. Background comparisons were conducted for each medium using site-specific background data and background concentrations.

### **3.2.2.1 Background Sample Locations**

Off-site, upgradient groundwater samples were collected from four locations, as indicated on Figure 3-1 and Figure 3-4, identified as UAA-1 through UAA-5. Groundwater samples were collected from each of the upgradient locations at several depths. Five surface soil and five subsurface soil samples were collected at off-site locations, all identified in the SSP. These background locations are presented on Figure 3-1 and Figure 3-3 (Locations OS-1 through OS-5). Eight surface water samples and eight sediment samples were collected from an area of the Mississippi River upgradient of the site at location R1, indicated on Figure 3-1 and Figure 3-5.

Soil samples (0.5 feet bgs and 6 feet bgs) were collected from location OS-5, located in the field immediately south of Site Q. In initial discussions, USEPA requested that the two samples from this location be included in the HHRA risk calculations. A comparison of detected concentrations in the samples indicated that concentrations of all constituents at this location are below screening levels with the exception of arsenic. The detected concentration of arsenic in the surface soil sample at OS-5 is 7.1 mg/kg, which is below the maximum detected concentration in the surface soil background samples of 9.05 mg/kg. The detected arsenic concentration in the subsurface soil sample at OS-5 is 4.4 mg/kg, which is below the maximum detected concentration in background subsurface soil samples of 6.7 mg/kg. Therefore, this sample location (OS-5) is considered to be representative of background or reference concentrations and was included in the background dataset.

### **3.2.2.2 Background Comparison Procedures**

The procedure for determining whether a constituent concentration is consistent with background follows that developed by USEPA Region 4 (USEPA, 2000a) and presented in the USEPA-approved HHRA Workplan (Appendix A). Maximum detected concentrations of constituents in environmental media at the site were compared to background levels, i.e., two times the arithmetic mean site-specific background concentration. USEPA Region 4 states that although RAGS (USEPA, 1989a) allows the use of statistics in data evaluation, statistics may not be sufficiently conservative at this stage of the risk evaluation; and in most cases, there are not a sufficient number of samples for conducting a statistical analysis. Therefore, if maximum concentrations in an area are found to be less than background levels, then those constituents are eliminated from quantitative evaluation in the risk assessment. Constituents whose maximum detected concentrations are above the defined background levels and not identified as an essential nutrient are retained for evaluation in the next step of the hazard identification process (Toxicity Screen).

Data from the off-site soil samples (five) were averaged together to derive the background concentrations. Separate background concentrations were derived for surface soil and subsurface soil. Data from upgradient sediment samples were averaged together to derive the background concentrations for sediment, and data from upgradient surface water samples were averaged together to derive the background concentrations for surface water. Each site groundwater location was matched to an off-site groundwater location based on location and physical characteristics of the site. Samples within each site groundwater location were then matched to the sample from the corresponding off-site groundwater location most closely matching the depth of the site sample.

The calculation of background concentrations is presented in Appendix C. Appendix C also presents a table indicating the matching of each site groundwater sample to the appropriate off-site groundwater sample.

### **3.2.3 Toxicity Screen**

A toxicity screen was performed in accordance with USEPA Region 5 guidance (USEPA, 1998b) and IEPA regulations (IEPA, 2002a and b).

#### **3.2.3.1 Sources of Screening Criteria**

USEPA Region 5 guidance identifies the following three sources as appropriate screening levels for soil, in order of preference:

- 1) Most recent generic soil screening levels (SSLs) developed and presented in Appendix A of the Soil Screening Guidance (USEPA, 1996b). The SSLs are based on ingestion and inhalation (direct contact) and soil-to-groundwater exposure pathways for a residential scenario.
- 2) Site-specific SSLs derived using the methodology outlined in the above reference.
- 3) Most recent USEPA Region 9 Preliminary Remediation Goals (PRGs; USEPA, 2002b).

The USEPA Region 9 PRGs are more comprehensive than the other sources because values are provided for a longer list of constituents, and PRGs are available for both residential and industrial scenarios. Therefore, USEPA Region 9 PRGs for industrial soils and ambient air were used to identify COPCs in soil and sediment, and to evaluate the 24-hour air data, respectively. Where PRGs were not available, structural similarity was used to assign a surrogate PRG. PRGs for noncarcinogens were adjusted by a factor of 0.1 to account for potential cumulative effects in the screening process. PRGs for potential carcinogens are based on a conservative target risk level of  $1 \times 10^{-6}$  and were not adjusted. The screening values are presented in Appendix D.

The TACO program provides screening criteria for the groundwater ingestion component of the soil to groundwater pathway that were used here (IEPA, 2002b). These values conservatively address leaching of constituents from soils to underlying groundwater.

Groundwater in Sauget Area 2 is classified as Class I by IEPA. Groundwater in Sauget Area 2 is not used as a source of drinking water and there are ordinances in effect in the Villages of Sauget and Cahokia (see information provided in Appendix P) that prohibit the use of groundwater as drinking water. Therefore, groundwater will not be evaluated as a source of residential or industrial drinking water in the risk assessment. The risk assessment will evaluate potential incidental exposure to constituents in groundwater and/or leachate via volatilization of constituents to indoor and outdoor air, and via direct contact with groundwater and/or leachate during excavation activities.

To identify COPCs to be evaluated quantitatively for the groundwater and surface water scenarios addressed in the risk assessment, constituent concentrations in groundwater and surface water were compared to IEPA Class I standards (35 Ill. Adm. Code 620.410) (IEPA, 2002a). For the Class I groundwater comparison, where Class I standards were not available, federal maximum contaminant levels (MCLs) (USEPA, 2002c) were used; where MCLs were not available, the IEPA remediation objectives for Class I groundwater were used (IEPA, 2002b); where these were not available, the most current USEPA PRGs (USEPA, 2002b) for tap water were used. As discussed in Section 3.1.4, only groundwater samples collected from a depth of less than or equal to 30 feet bgs are included in the quantitative risk assessment. Groundwater samples collected from depths greater than 30 feet bgs are evaluated in Appendix F.

Ambient air concentrations were compared to USEPA Region 9 PRGs for ambient air (USEPA, 2002b).

USEPA Region 9 PRGs are not available for fish fillet. Therefore, fish fillet data were compared to the USEPA Region 3 Risk-Based Concentrations (RBCs) for fish (USEPA, 2003a). As fish fillet data were available for evaluation, a comparison of surface water data to human health Ambient Water Quality Criteria (AWQCs) for fish ingestion (USEPA, 2002d) was not required. As previously noted, surface water data were compared to the groundwater screening criteria described above.

Appendix D presents the specific screening values used in this risk assessment for the industrial soil/sediment – direct contact screen, the soil to groundwater pathway screen, the groundwater and surface water screen, the air screen, and the fish tissue screen.

### **3.2.3.2 Screening Methodology**

Constituents in an area/medium that did not screen out based on background, essential nutrient status, and/or frequency of detection with maximum concentrations greater than the toxicity screening criteria

are included as COPCs. Where no COPCs are identified for an area/medium, that area/medium is not evaluated quantitatively in the HHRA.

### 3.3 Hazard Identification

This section presents the results of the COPC screening by medium and area. COPCs identified here are included in subsequent risk calculations.

#### 3.3.1 Soils and Waste

Data for site soils were compared to background, industrial direct contact screening values and the soil to groundwater pathway screening values. Calculation of background concentrations of constituents in soils is presented in Appendix C Table C-1 for surface soils and Table C-2 for combined soils. Two screens were conducted for soil – surface soil and combined soils. The combined soil screen consists of data from surface soil, subsurface soil, and waste samples. The data collected from these three media represent the media that could potentially be contacted by a future construction worker, as well as a potential source of constituents to indoor and outdoor air. The surface soil screen consists of data collected from the top 0.5 foot bgs, and is intended to represent the portion of the soil column to which a non-excavation receptor may potentially be exposed.

Maximum constituent concentrations in surface soil and combined soil in all sites were compared to industrial screening values for direct contact. The screening tables are presented in Appendix B.

Surface Soil. COPCs in surface soil are identified in Table 3-1. COPCs were identified in Site O, Site O (North), Site P, Site Q (North), Site Q (Central), Site Q (South), and Site S. No COPCs were identified in Site R surface soils. Figure 3-7 presents the locations of the COPCs in surface soil. No constituents were screened out on the basis of frequency of detection. Arsenic was screened out based on background for O, Site O (North), Site Q (North), R and S. Benzo(a)pyrene was screened out based on background for Site Q (Central).

Combined Soil. COPCs in combined soil are identified in Table 3-2. COPCs in combined soils were identified in all sites for the construction worker direct-contact pathway. COPCs in combined soils for the ambient air pathway (non-excavation scenarios) were identified in all Sites with the exception of Site Q (Central). Figure 3-8 presents the locations of the COPCs in combined soils. No constituents were screened out on the basis of frequency of detection. Arsenic was screened out based on background for Sites O and S.

### **3.3.2 Groundwater and Leachate**

Data for groundwater were compared to drinking water screening values. Calculation of background concentrations of constituents in groundwater is presented in Appendix C Table C-3, and the matching of site to off-site locations is presented in Table C-4. Three screens were conducted on groundwater/leachate – shallow, shallow/mid, and deep. As indicated previously, locations beginning with “AA” were screened in the alluvial aquifer, while those beginning with “BDRK” were screened in bedrock.

#### **3.3.2.1 Leachate, Shallow and Mid Groundwater**

The selection of COPCs for groundwater was conducted on a location-by-location basis. The screening tables are presented in Appendix B, which lists each location included in the analysis. Screening intervals and/or sample depths are also included. Locations with samples in the shallow groundwater range (AA-O-1 and AA-O-2, first sample within 20 feet bgs, indicating a depth to groundwater within 15 feet of ground surface) were used to select COPCs for the future construction worker scenario as well as the potential volatilization pathway. Locations with samples in the mid-depth range (AA-O-1, AA-O-2, AA-O-3, AA-P-1, AA-P-2, AA-P-3, AA-Q-6, AA-Q-7, AA-Q-8, AA-R-1, AA-S-1, AA-S-2, and AA-S-3, first sample within 35 feet bgs, indicating depth to groundwater within 30 feet bgs) were used to select COPCs for the potential volatilization pathway. Locations AA-O-1 and AA-O-2 had samples collected from both the shallow and mid-depth ranges. Therefore, the shallower sample from each location was used to select COPCs for the potential volatilization pathway. Additionally, several locations (AA-P-1, AA-P-2, AA-Q-6, AA-Q-7, AA-Q-8, AA-S-1, and AA-S-3) in the mid-depth range had multiple samples located within the mid-depth range. For these locations, the shallowest sample was used to select COPCs for the potential volatilization pathway. The deeper samples from all of these locations are screened against the IEPA Class I standards (see Appendix F).

Leachate data were treated as shallow groundwater samples in the screening process.

Ordinances are in effect that prohibit the use of groundwater as a potable water supply source (Appendix P). Therefore, a drinking water scenario is not included in the risk assessment. Groundwater COPCs were identified to evaluate potential incidental exposures to groundwater (i.e., non-drinking water scenarios), including incidental contact by a construction worker that may excavate to a depth where groundwater would be exposed in the excavation, or potential volatilization of VOCs through the soil column to indoor or outdoor air.

Data from 24 groundwater sampling locations were included in the screening evaluation. Two locations have a depth to groundwater of less than or equal to 15 feet bgs and are, therefore, included in the evaluation of potential future construction activities (AA-O-1 and AA-O-2), and 13 locations have a depth to groundwater of less than or equal to 30 feet bgs and are, therefore, included in the

evaluation of potential volatilization effects. These 13 locations are included in the quantitative HHRA. The locations are listed below:

- AA-O-1
- AA-O-2
- AA-O-3
- AA-P-1
- AA-P-2
- AA-P-3
- AA-Q-6
- AA-Q-7
- AA-Q-8
- AA-R-1
- AA-S-1
- AA-S-2
- AA-S-3

The remaining 11 locations have depths to groundwater greater than 30 feet bgs, and are not included in the quantitative risk assessment. These locations are addressed in Appendix F.

The results of the COPC selection are presented in Table 3-4 for shallow groundwater and leachate (for evaluation of the construction worker receptor), and Table 3-5 for mid/shallow groundwater and leachate (for evaluation of the air pathway). COPCs for the construction worker pathway were identified at location AA-O-1 groundwater, as well as at the Site O, Site Q, and Site R leachate wells. COPCs were identified for the volatilization pathway (indoor and outdoor air) at groundwater locations AA-Q-6 and AA-R-1, as well as leachate wells in Sites O, Q, and R. Figure 3-9 indicates the locations of the groundwater and leachate COPCs. Because the screen was conducted on a sample-by-sample basis, no constituents were screened out based on frequency of detection. Methane was the only constituent that screened out based on a comparison to background.

### **3.3.3 Sediment**

Maximum constituent concentrations in sediment in the Site Q Pond and in the Mississippi River were compared to industrial soil screening values for direct contact, per the HHRA Workplan. The screening table is presented in Appendix B.

No COPCs were identified in Site Q Pond sediment. Arsenic was identified as a COPC in Mississippi River sediment, as shown in Table 3-5 and in Figure 3-10. The figure indicates which locations in the Mississippi River had arsenic concentrations greater than the calculated upgradient sediment concentration of 4.66 mg/kg.

#### **3.3.4 Surface Water**

Maximum constituent concentrations in surface water in the Site Q Pond and in the Mississippi River were compared to the screening values for surface water, which are the IEPA Class I standards. The screening table is presented in Appendix B.

COPCs for the Site Q Pond and the Mississippi River are shown in Table 3-6 and in Figure 3-10. The figure indicates which locations in the Mississippi River had constituent concentrations above screening levels. Constituents each detected in one of 36 samples in Mississippi River surface water (2,4,6-trichlorophenol, 2,6-dinitrophenol, and pentachlorophenol) were eliminated as COPCs based on frequency of detection.

#### **3.3.5 Fish**

Maximum constituent concentrations in fish fillet samples collected from the Site Q Pond and in the Mississippi River were compared to the USEPA Region 3 RBCs for fish tissue (USEPA, 2003a). The screening tables are presented in Appendix B.

Several COPCs were identified in fillet samples of carp and black bullhead in the Site Q Pond, and in buffalo fish fillet in the Mississippi River. These COPCs are indicated on Table 3-7. Figure 3-11 indicates the locations of the COPCs in fish fillet.

TABLE 3-1  
SUMMARY OF COPCS IN SURFACE SOIL  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Constituent	CAS	Site O	Site O North	Site P	Site Q North	Site Q Central	Site Q South	Site R	Site S
<b>SVOCs</b>									
2,4,6-Trichlorophenol	88-06-2								X
2 Nitroaniline	88-74-4								X
4 Nitroaniline	100-01-6								X
Benzo(a)anthracene	56-55-3						X		X
Benzo(a)pyrene	50-32-8			X	X		X		X
Benzo(b)fluoranthene	205-99-2						X		X
Dibenzo(a,h)anthracene	53-70-3				X				X
<b>Pesticide</b>									
4,4'-DDT	50-29-3								X
beta-BHC	319-85-7								X
Dieldrin	60-57-1	X					X		
gamma-BHC (Lindane)	58-89-9								X
Heptachlor	76-44-8								X
<b>Herbicide</b>									
Pentachlorophenol	87-86-5								X
<b>PCBs</b>									
Total PCBs	1336-36-3	X	X	X	X	X	X		X
<b>Dioxin</b>									
2,3,7,8-TCDD-TEQ	1746-01-6	X	X			X	X		
<b>Metals</b>									
Antimony	7440-36-0						X		
Arsenic	7440-38-2			X		X	X		
Cadmium	7440-43-9				X				
Chromium	7440-47-3						X		
Manganese	7439-96-5						X		
Mercury	7439-97-6		X						
<b>Total</b>		<b>3</b>	<b>3</b>	<b>3</b>	<b>4</b>	<b>3</b>	<b>10</b>	<b>0</b>	<b>13</b>

**TABLE 3-1**  
**SUMMARY OF COPCS IN SURFACE SOIL**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, ILLINOIS**

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Page 2 of 2

Constituent	CAS	Site O	Site O North	Site P	Site Q North	Site Q Central	Site Q South	Site R	Site S
-------------	-----	--------	--------------	--------	--------------	----------------	--------------	--------	--------

Notes

CAS - Chemical Abstracts Service.

COPC - Constituent of Potential Concern.

PCB - Polychlorinated Biphenyl.

SVOC - Semivolatile organic compound

TCDD-TEQ - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalent Concentration.

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**TABLE 3-2**  
**SUMMARY OF COPCS IN COMBINED SOIL (SURFACE, SUBSURFACE, WASTE)**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, ILLINOIS**

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Constituent	CAS	Construction Worker Pathway								Volatilization Pathway (a)							
		Site O	Site O North	Site P	Site Q North	Site Q Central	Site Q South	Site R	Site S	Site O	Site O North	Site P	Site Q North	Site Q Central	Site Q South	Site R	Site S
VOCs																	
1,1,2-Trichloroethane	79-00-5							X								X	
1,2-Dichloroethane	107-06-2				X			X				X				X	
1,2-Dichloroethene (total)	540-59-0							X								X	
4-Methyl-2-pentanone (MIBK)	108-10-1								X								X
Benzene	71-43-2	X	X	X	X		X	X	X	X	X	X	X		X	X	X
Chlorobenzene	108-90-7	X	X					X	X	X	X					X	X
Chloroform	67-66-3							X								X	
Dichloromethane	75-09-2		X						X		X						X
Ethylbenzene	100-41-4	X	X	X	X		X	X	X	X	X	X	X		X	X	X
Tetrachloroethene	127-18-4		X	X	X			X	X		X	X	X			X	X
Toluene	108-88-3	X					X	X	X	X					X	X	X
Trichloroethylene	79-01-6			X	X		X	X	X			X	X		X	X	X
Xylenes, Total	1330-20-7	X	X	X	X		X	X	X	X	X	X	X		X	X	X
SVOCs																	
1,2-Dichlorobenzene	95-50-1		X														
1,3-Dichlorobenzene	541-73-1		X						X								
1,4-Dichlorobenzene	106-46-7	X	X	X				X	X								
2,4,6-Trichlorophenol	88-06-2	X	X		X			X	X								
2,4-Dichlorophenol	120-83-2				X			X									
2-Chlorophenol	95-57-8							X									
2-Methylnaphthalene	91-57-6		X														
2-Nitroaniline	88-74-4	X	X		X			X	X								
4-Nitroaniline	100-01-6		X					X	X								
Benzo(a)anthracene	56-55-3	X	X		X	X	X		X								
Benzo(a)pyrene	50-32-8	X	X	X	X	X	X		X								
Benzo(b)fluoranthene	205-99-2	X	X		X	X	X		X								
bis(2-Chloroethyl)ether	111-44-4		X														
bis(2-Ethylhexyl)phthalate	117-81-7								X								
Dibenzo(a,h)anthracene	53-70-3	X	X		X				X								
Hexachlorobenzene	118-74-1		X														

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**TABLE 3-2**  
**SUMMARY OF COPCS IN COMBINED SOIL (SURFACE, SUBSURFACE, WASTE)**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, ILLINOIS**

Constituent	CAS	Construction Worker Pathway								Volatilization Pathway (a)							
		Site O	Site O North	Site P	Site Q North	Site Q Central	Site Q South	Site R	Site S	Site O	Site O North	Site P	Site Q North	Site Q Central	Site Q South	Site R	Site S
Naphthalene	91-20-3		X					X	X								
Nitrobenzene	98-95-3		X					X									
<b>Pesticide</b>																	
4,4'-DDE	72-55-9		X														
4,4'-DDT	50-29-3		X						X								
Aldrin	309-00-2	X	X			X	X		X								
alpha-BHC	319-84-6		X														
beta-BHC	319-85-7		X					X	X								
delta-BHC	319-86-8	X															
DDT	60-57-1	X	X	X	X	X	X	X	X								
gamma-BHC (Lindane)	58-89-9	X							X								
Heptachlor	76-44-8	X	X					X	X								
Heptachlor Epoxide	1024-57-3	X	X				X										
<b>Herbicide</b>																	
MCPA	94-74-6			X													
MCPP	93-65-2							X									
Pentachlorophenol	87-86-5				X	X	X		X								
<b>PCBs</b>																	
Total PCBs	1336-36-3	X	X	X	X	X	X	X	X								
<b>Dioxin</b>																	
2,3,7,8-TCDD-TEQ	1746-01-6	X	X	X	X	X	X	X	X								
<b>Metals</b>																	
Antimony	7440-36-0				X		X										
Arsenic	7440-38-2		X	X	X	X	X	X									
Barium	7440-39-3				X												
Cadmium	7440-43-9		X	X	X												
Chromium	7440-47-3						X		X								
Copper	7440-50-8					X											
Lead	7439-92-1				X		X		X								
Manganese	7439-96-5					X	X										
Mercury	7439-97-6		X				X	X									

**TABLE 3-2**  
**SUMMARY OF COPCS IN COMBINED SOIL (SURFACE, SUBSURFACE, WASTE)**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, ILLINOIS**

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Constituent	CAS	Construction Worker Pathway								Volatilization Pathway (a)							
		Site O	Site O North	Site P	Site Q North	Site Q Central	Site Q South	Site R	Site S	Site O	Site O North	Site P	Site Q North	Site Q Central	Site Q South	Site R	Site S
Nickel	7440-02-0						X										
Total		20	34	13	22	11	21	27	31	5	6	5	6	0	5	11	9

Notes

CAS - Chemical Abstracts Service

COPC - Constituent of Potential Concern

MCPA - 2-Methyl-4-chlorophenoxyacetic acid

MCPP - 2-(2-Methyl-4-chlorophenoxy) propionic acid

PCB - Polychlorinated Biphenyl

SVOC - Semivolatile organic compound

TCDD-TEQ - 2,3,7 8-Tetrachlorodibenzo-p-dioxin Toxic Equivalent Concentration

VOC - Volatile Organic Compound

(a) - Only VOCs are identified as COPCs for the volatilization pathway

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**TABLE 3-3**  
**SUMMARY OF COPCS IN SHALLOW GROUNDWATER AND LEACHATE**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, ILLINOIS**

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Page 1 of 2

Constituent	CAS	Shallow Groundwater/Leachate Location (s)				
		L-O-1	O - AA-O-1-16	O-AA-O-2-13	L-Q-1	L-R-1
VOCs						
1,2-Dichloroethane	107-06-2				X	X
1,2-Dichloroethene (total)	540-59-0					X
2-Butanone (MEK)	78-93-3					X
4-Methyl-2-pentanone (MIBK)	108-10-1	X			X	
Acetone	67-64-1				X	X
Benzene	71-43-2	X			X	X
Chlorobenzene	108-90-7	X			X	X
Chloroform	67-66-3					X
Dichloromethane	75-09-2				X	X
Tetrachloroethene	127-18-4				X	X
Toluene	108-88-3					X
Trichloroethylene	79-01-6				X	X
SVOCs						
2,4,6-Trichlorophenol	88-06-2	X			X	
2,4-Dichlorophenol	120-83-2	X			X	
2,4-Dimethylphenol	105-67-9				X	
2-Chlorophenol	95-57-8	X			X	X
2-Nitroaniline	88-74-4	X			X	
3-Methylphenol/4-Methylphenol	106-44-5	X			X	X
4-Chloroaniline	106-47-8	X			X	X
4-Nitroaniline	100-01-6	X			X	X
Benzo(a)pyrene	50-32-8		X			
Benzo(b)fluoranthene	205-99-2		X			
Benzo(g,h,i)perylene	191-24-2					X
Benzo(k)fluoranthene	207-08-9		X			
Dibenzo(a,h)anthracene	53-70-3		X			
Indeno(1,2,3-cd)pyrene	193-39-5		X			
Naphthalene	91-20-3	X			X	
Nitrobenzene	98-95-3	X			X	
Phenol	108-95-2	X			X	X
Pesticide						
4,4'-DDT	50-29-3					X
beta-BHC	319-85-7	X			X	X
Dieldrin	60-57-1					X
Endrin Ketone	53494-70-5				X	
gamma-BHC (Lindane)	58-89-9					X
Heptachlor	76-44-8					X
Herbicide						
2,4,5-T	93-76-5	X				
2,4-D	94-75-7	X			X	X
Pentachlorophenol	87-86-5	X			X	
PCBs						
Total PCBs	1336-36-3	X			X	X

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TABLE 3-3

**SUMMARY OF COPCS IN SHALLOW GROUNDWATER AND LEACHATE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS**

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Page 2 of 2

Constituent	CAS	Shallow Groundwater/Leachate Location (a)				
		L-O-1	O - AA-O-1-16	O-AA-O-2-13	L-Q-1	L-R-1
<b>Dioxin</b>						
2,3,7,8-TCDD-TEQ	1746-01-6	X				X
<b>Metals</b>						
Antimony	7440-36-0				X	
Arsenic	7440-38-2		X			
Beryllium	7440-41-7					X
Chromium	7440-47-3					X
Cobalt	7440-48-4					X
Lead	7439-92-1		X			
Manganese	7439-96-5	X	X		X	X
Mercury	7439-97-6					X
Nickel	7440-02-0				X	X
Thallium	7440-28-0	X				X
Vanadium	7440-62-2					X
Zinc	7440-66-6				X	X
<b>Total:</b>		<b>21</b>	<b>8</b>	<b>0</b>	<b>28</b>	<b>34</b>

## Notes:

CAS - Chemical Abstracts Service.

COPC - Constituent of Potential Concern.

PCB - Polychlorinated Biphenyl.

SVOC - Semivolatile organic compound.

TCDD-TEQ - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalence Concentration.

VOC - Volatile Organic Compound.

(a) - Shallow groundwater and leachate evaluated for potential direct contact by construction worker.

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**TABLE 3-4**  
**SUMMARY OF VOLATILE COPCS IN MID AND SHALLOW GROUNDWATER AND LEACHATE**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, ILLINOIS**

		Mid/Shallow Groundwater/Leachate Location (a)															
Constituent	CAS	L-O-1	O - AA-O-1-16	O-AA-O-2-13	O - AA-O-3-28	P - AA-P-1-24	P - AA-P-2-24	P - AA-P-3-32	L-Q-1	Q - AA-Q-6-24	Q - AA-Q-7-24	Q - AA-Q-8-24	L-R-1	R - AA-R-1-28	S - AA-S-1-24	S - AA-S-2-28	S - AA-S-3-24
VOCs																	
1,2-Dichloroethane	107-06-2								X				X				
1,2-Dichloroethene (total)	540-59-0												X				
2-Butanone (MEK)	78-93-3												X				
4-Methyl-2-pentanone (MIBK)	108-10-1	X							X								
Acetone	67-64-1								X				X				
Benzene	71-43-2	X							X	X			X	X			
Chlorobenzene	108-90-7	X							X				X	X			
Chloroform	67-66-3												X				
Chloromethane	74-87-3														X		
Dichloromethane	75-09-2								X				X				
Tetrachloroethene	127-18-4								X				X				
Toluene	108-88-3												X				
Trichloroethylene	79-01-6								X				X				
Total		3	0	0	0	0	0	0	8	1	0	0	11	3	0	0	0

Notes

CAS - Chemical Abstracts Service

COPC - Constituent of Potential Concern

VOC - Volatile Organic Compound

(a) AA - Designates alluvial aquifer sample

L - Designates leachate sample

Only VOCs are candidates for COPC selection as volatilization to indoor/outdoor air is the potential exposure pathway evaluated for this medium. COPCs for direct contact with shallow groundwater/leachate are identified in Table 3-3.

**TABLE 3-5**  
**SUMMARY OF COPCS IN SEDIMENT**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, ILLINOIS**

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Constituent	CAS	Pond (Site Q)	River
<b>Metals</b>			
Arsenic	7440-38-2		X
<b>Total:</b>		<b>0</b>	<b>1</b>

**Notes**

CAS - Chemical Abstracts Service

COPC - Constituent of Potential Concern

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**TABLE 3-6**  
**SUMMARY OF COPCS IN SURFACE WATER**  
**HUMAN HEALTH RISK ASSESSMEN**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, ILLINOIS**

Constituent	CAS	Pond (Site Q)	River
<b>SVOCs</b>			
2,4-Dichlorophenol	120-83-2		X
4-Chloroaniline	106-47-8		X
<b>Herbicide</b>			
MCPA	94-74-6		X
MCPP	93-65-2		X
<b>Metals</b>			
Lead	7439-92-1	X	
Manganese	7439-96-5	X	
<b>Total:</b>		<b>2</b>	<b>4</b>

## Notes

CAS - Chemical Abstracts Service

COPC - Constituent of Potential Concern

MCPA - 2-Methyl-4-chlorophenoxyacetic acid

MCPP - 2-(2-Methyl-4-chlorophenoxy) propionic acid

SVOC - Semivolatile organic compound

TABLE 3-7  
SUMMARY OF COPCS IN FISH FILLET  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

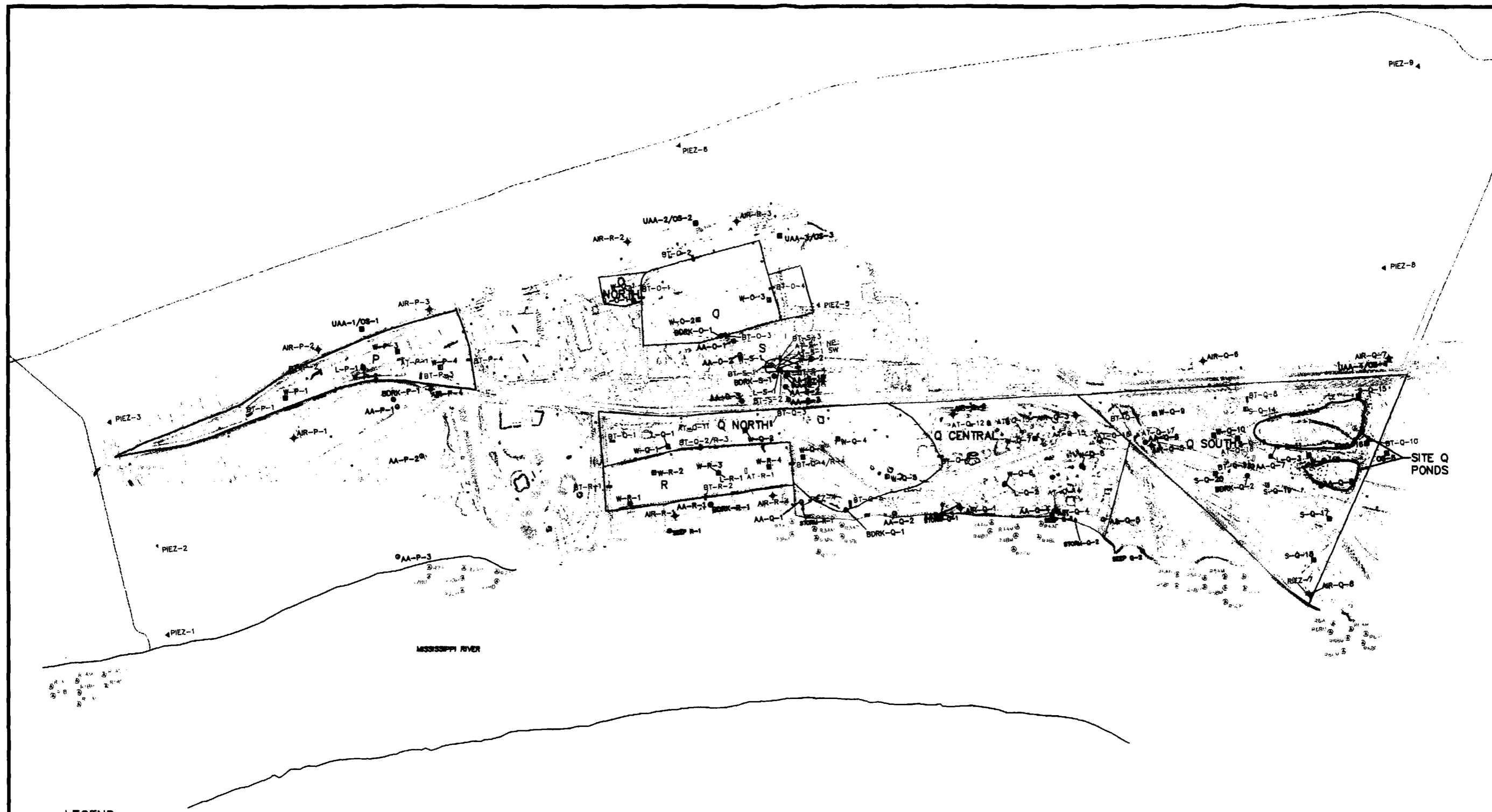
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Constituent	CAS	Mississippi River			Pond (Site Q)	
		DDA - Buffalo Fillet	PDA - Buffalo Fillet	UDA - Buffalo Fillet	Black Bullhead Fillet	Carp Fillet
SVOCs						
Benzo(a)anthracene	56-55-3					X
Benzo(a)pyrene	50-32-8					X
bis(2-Ethylhexyl)phthalate	117-81-7					X
Dibenzo(a h)anthracene	53-70-3					X
Pesticide						
4,4'-DDE	72-55-9			X		
4 4'-DDT	50-29-3				X	X
alpha-Chlordane	5103-71-9				X	X
beta-BHC	319-85-7					X
Dieldrin	60-57-1			X	X	X
PCBs						
Total PCBs	1336-36-3				X	X
Dioxin						
2,3,7,8-TCDD-TEQ	1746-01-6	X	X	X	X	X
Metals						
Arsenic	7440-38-2				X	X
Mercury	7439-97-6				X	X
Total		1	1	3	7	12

Notes

CAS - Chemical Abstracts Service  
COPC - Constituent of Potential Concern  
DDA - Downstream Discharge Area  
PCB - Polychlorinated Biphenyl  
PDA - Plume Discharge Area  
SVOC - Semivolatile organic compound  
TCDD-TEQ - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalence Concentration  
UDA - Upstream Discharge Area

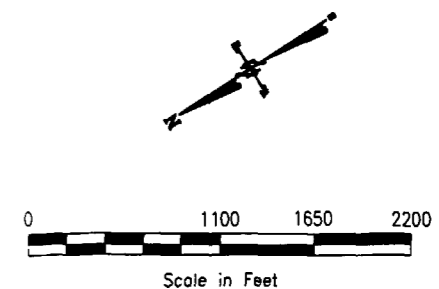
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**LEGEND**

- Off-site Soil and Upgradient/Groundwater Sampling Locations
- Site-Related Groundwater Sampling Locations
- Bedrock Monitoring Well
- ▲ Piezometer Cluster
- ✦ Air Sampling Location
- Boundary Trench Location
- Anomaly Trench Location
- Waste Characterization Boring Location
- ▲ Leachate Monitoring Well Location
- River/Pond Sediment/Surface Water Sample Location
- ◆ Stormwater Sample Locations

Base map from URS entitled "SAUGET AREA 2, RI/FS, SAUGET ILLINOIS", dated 3/27/03, drawn by "djd" and designed by "sjs".



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APPROVED BY:	KS				

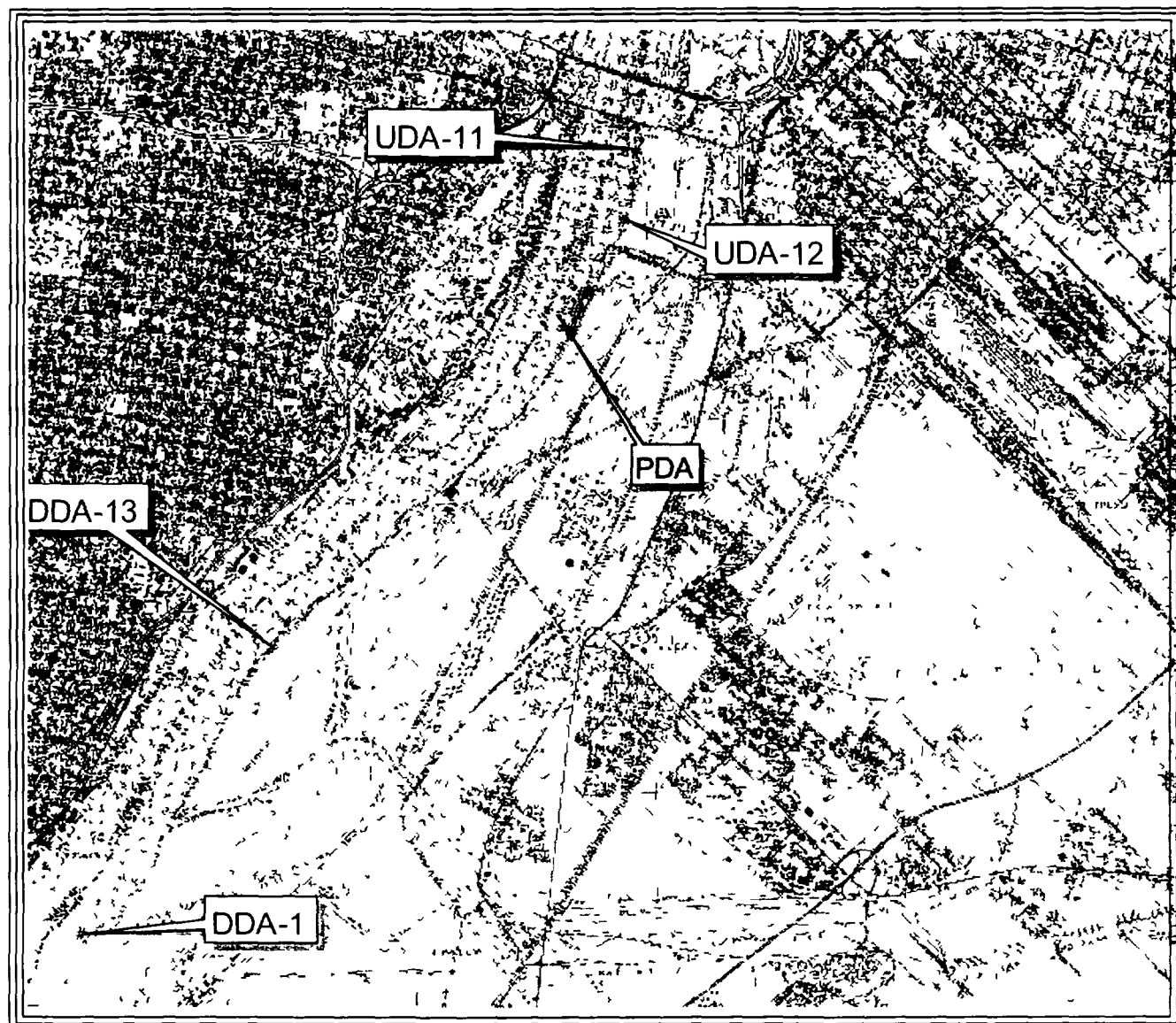
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SAMPLE LOCATIONS  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, IL

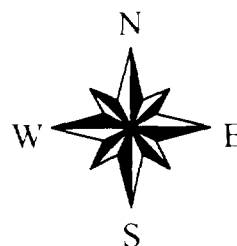
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DATE: 7/03  
PROJECT NUMBER: 06105-009

FIGURE NUMBER:  
**3-1**  
SHEET NUMBER:  
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Figure 3-2 Mississippi River Fish Sampling Locations  
Human Health Risk Assessment, Sauget Area 2 RI/FS  
Sauget, Illinois



1 0 1 2 Miles

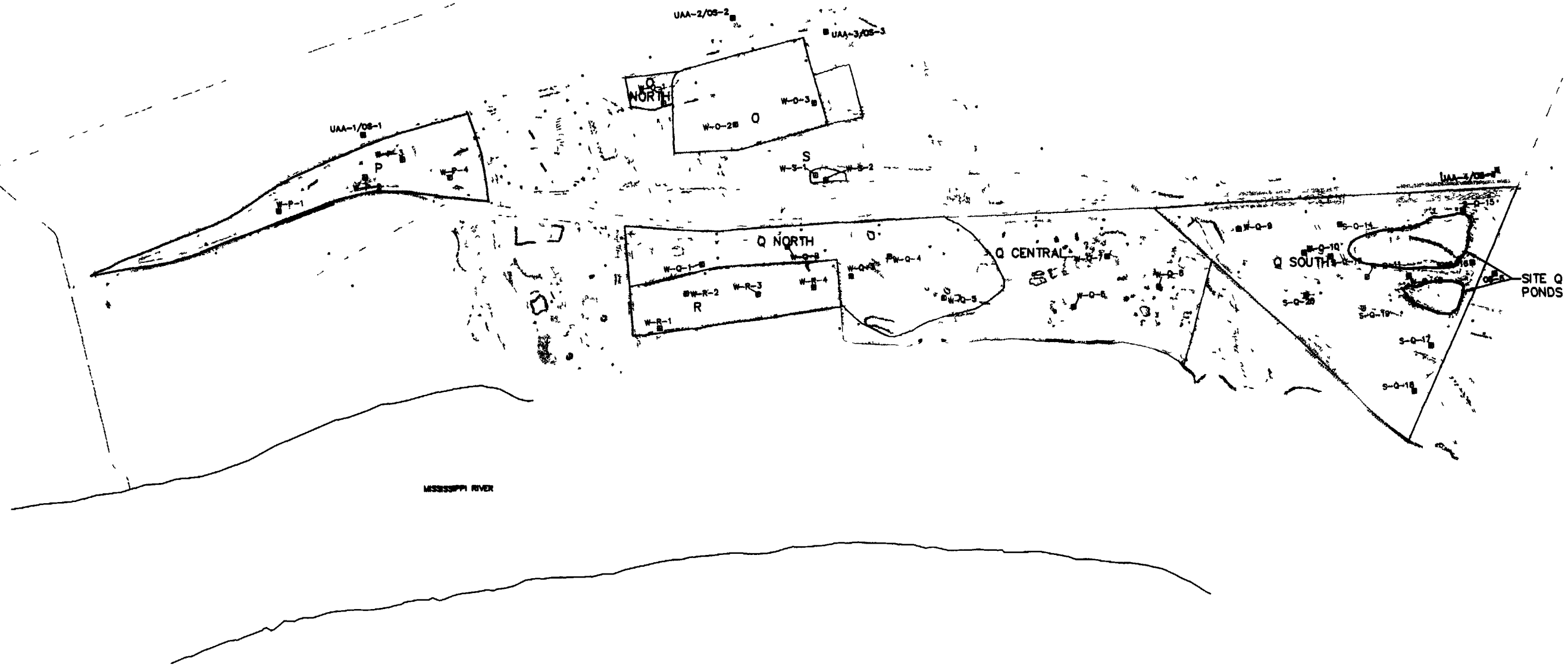
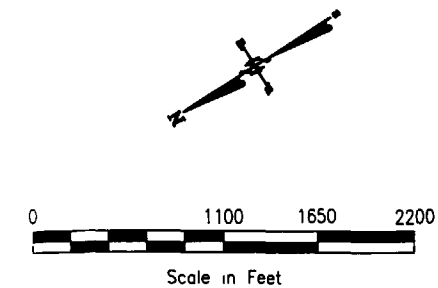


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**LEGEND**

- Off-site Soil and Upgradient/Groundwater Sampling Locations
- Waste Characterization Boring Location

Base map from URS entitled "SAUGET AREA 2, RI/FS, SAUGET ILLINOIS", dated 3/27/03, drawn by "djd" and designed by "sjs".



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CHECKED BY:	KS		
APPROVED BY:	KS		

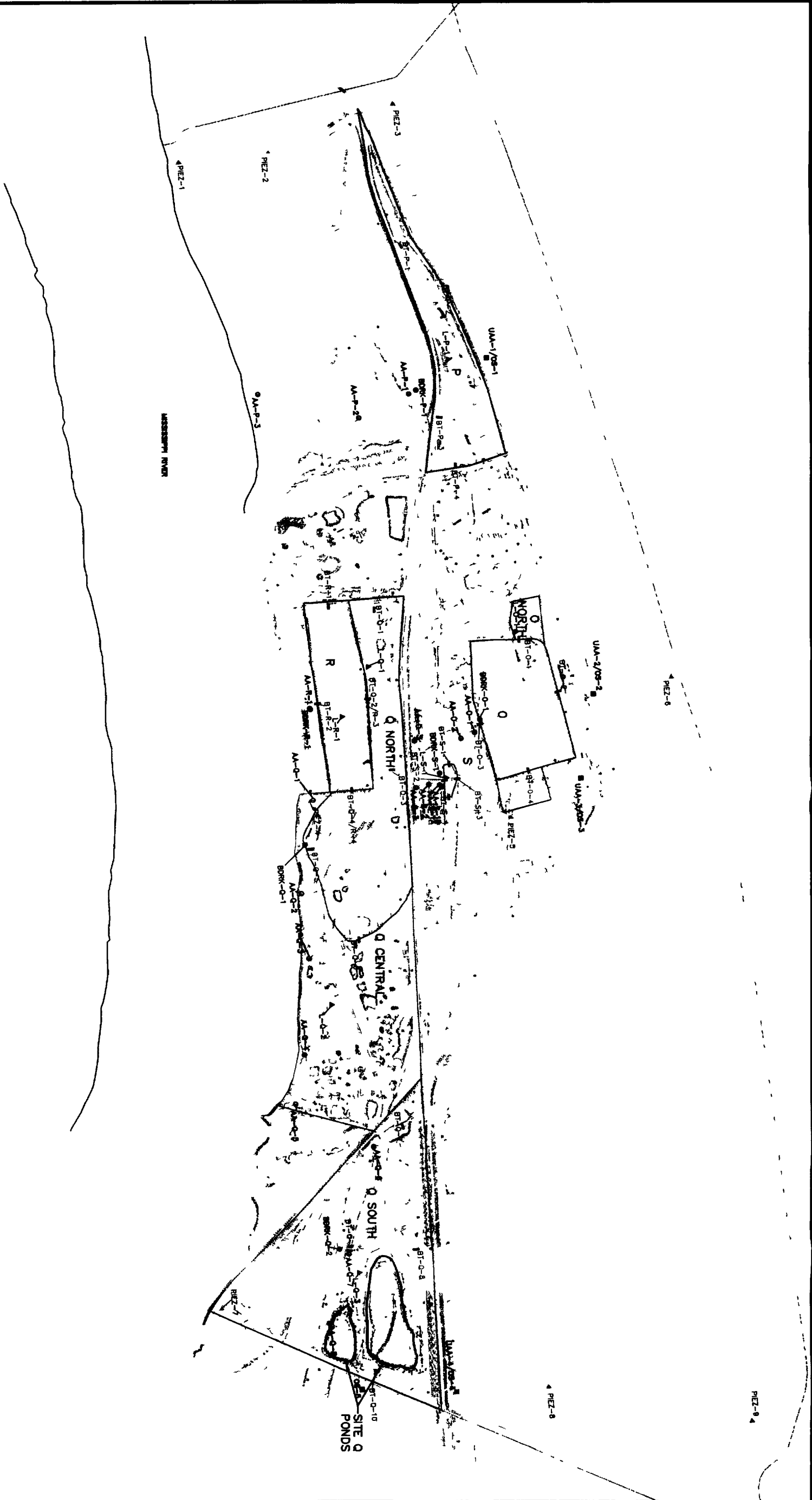
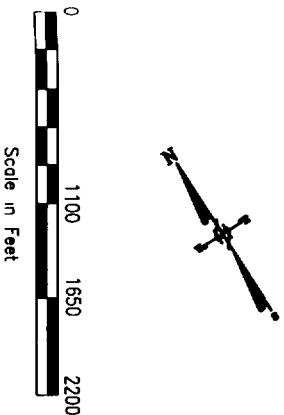
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SOIL/WASTE SAMPLE LOCATIONS HUMAN HEALTH RISK ASSESSMENT SAUGET AREA 2 RI/FS SAUGET, IL			
SCALE: 1"=1100'	DATE: 7/03	PROJECT NUMBER: 06105-009	

FIGURE NUMBER: <b>3-3</b>	SHEET NUMBER: X
------------------------------	--------------------

- LEGEND**
- Off-site Soil and Upgradient/Groundwater Sampling Locations
  - Site-Related Groundwater Sampling Locations
  - Bedrock Monitoring Well
  - ▲ Piezometer Cluster
  - ▲ Leachate Monitoring Well Location

Base map from URS entitled "SAUGET AREA 2, RI/FS, SAUGET ILLINOIS", dated 3/27/03, drawn by "djd" and designed by "sjs".



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SHEET NUMBER:	X

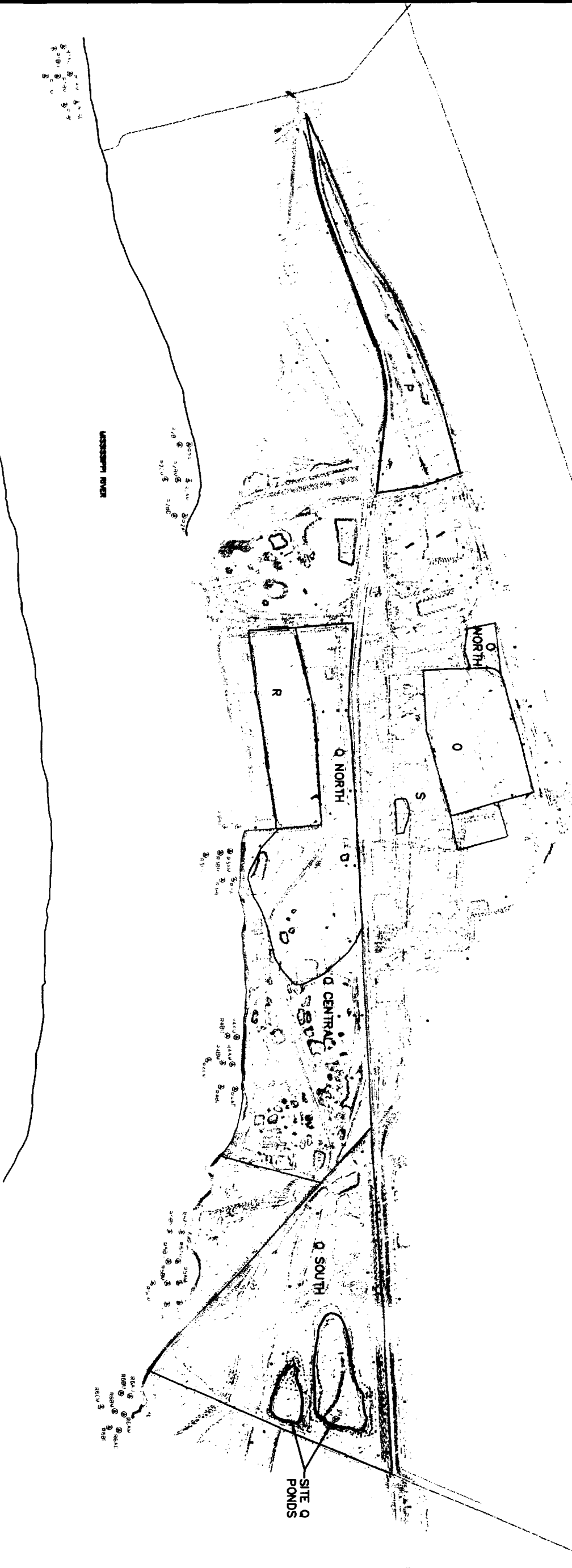
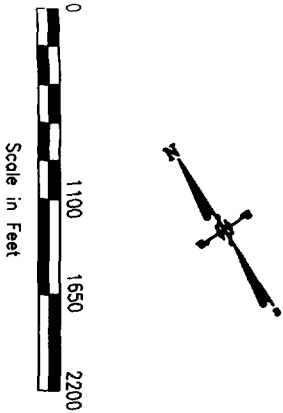
GROUNDWATER/LEACHATE SAMPLE LOCATIONS HUMAN HEALTH RISK ASSESSMENT SAUGET AREA 2 RI/FS SAUGET, IL		
SCALE:	DATE:	PROJECT NUMBER:
1"=1100'	7/03	06105-009

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LEGEND  
3 River/Pond Soil Sediment/Surface Water Sample Location

Base map from URS entitled "SAUGET AREA 2, RI/FS, SAUGET ILLINOIS", dated 3/27/03, drawn by "djd" and designed by "sjs".



SEDIMENT/SURFACE WATER SAMPLE LOCATIONS  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, IL

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3-5

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LEGEND  
+ Air Sampling Location

Base map from URS entitled "SAUGET AREA 2, RI/FS, SAUGET ILLINOIS", dated 3/27/03, drawn by "dyd" and designed by "sjs".

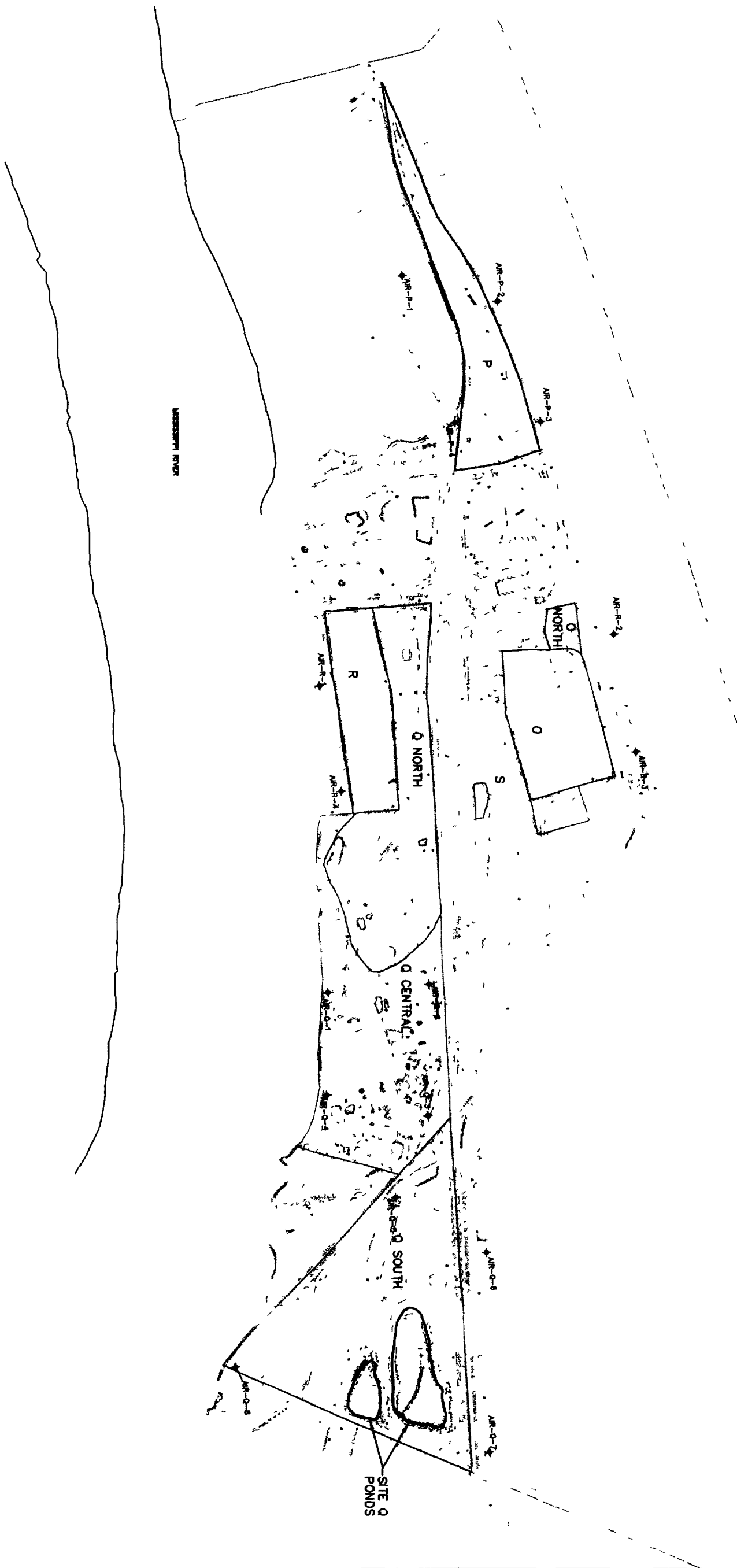
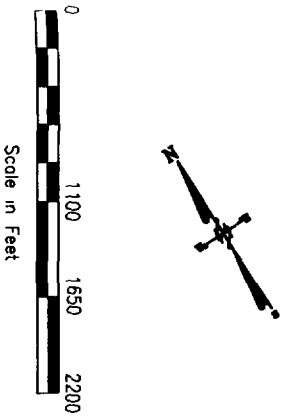
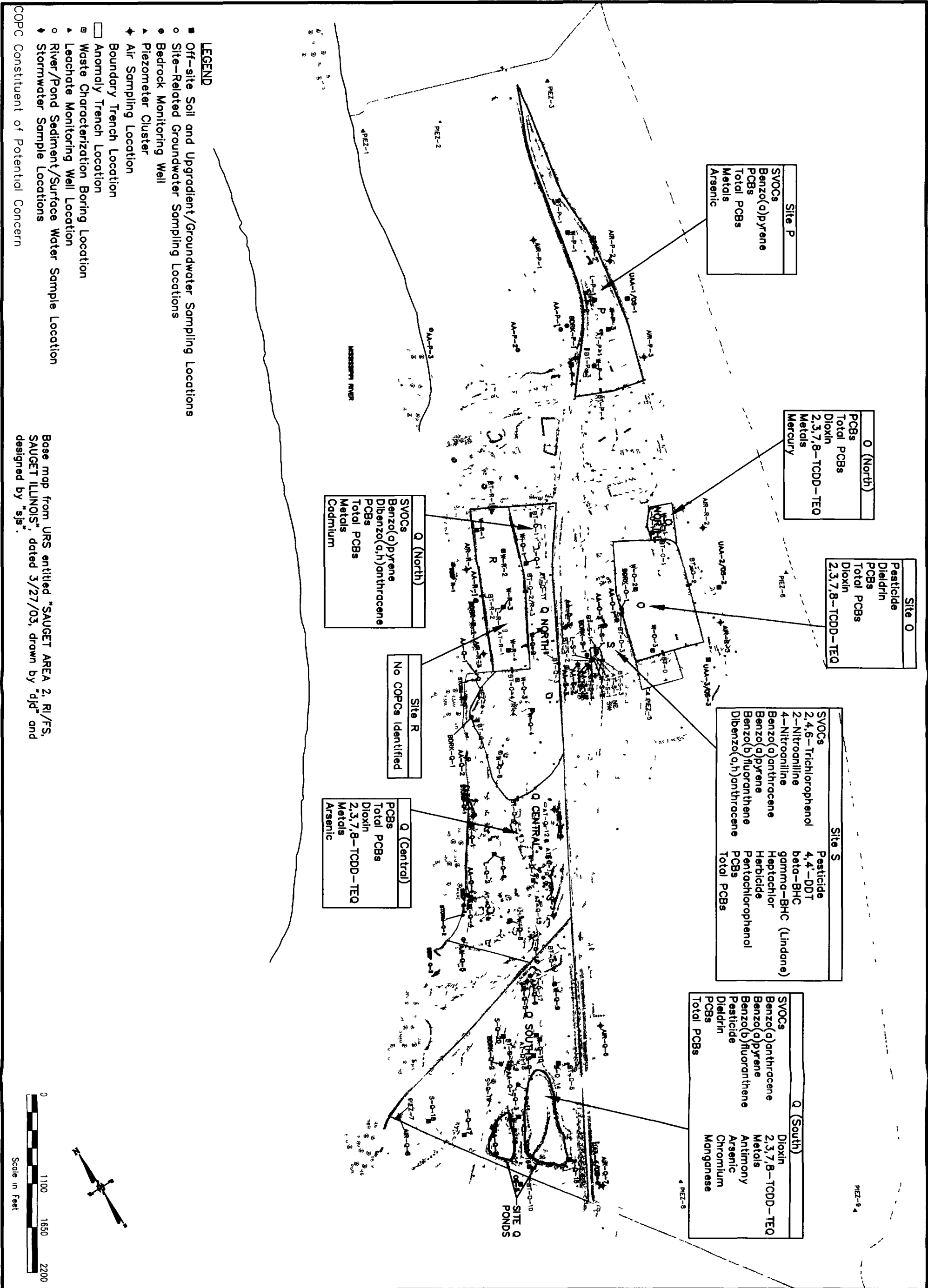


FIGURE NUMBER:	3-6
SHEET NUMBER:	X

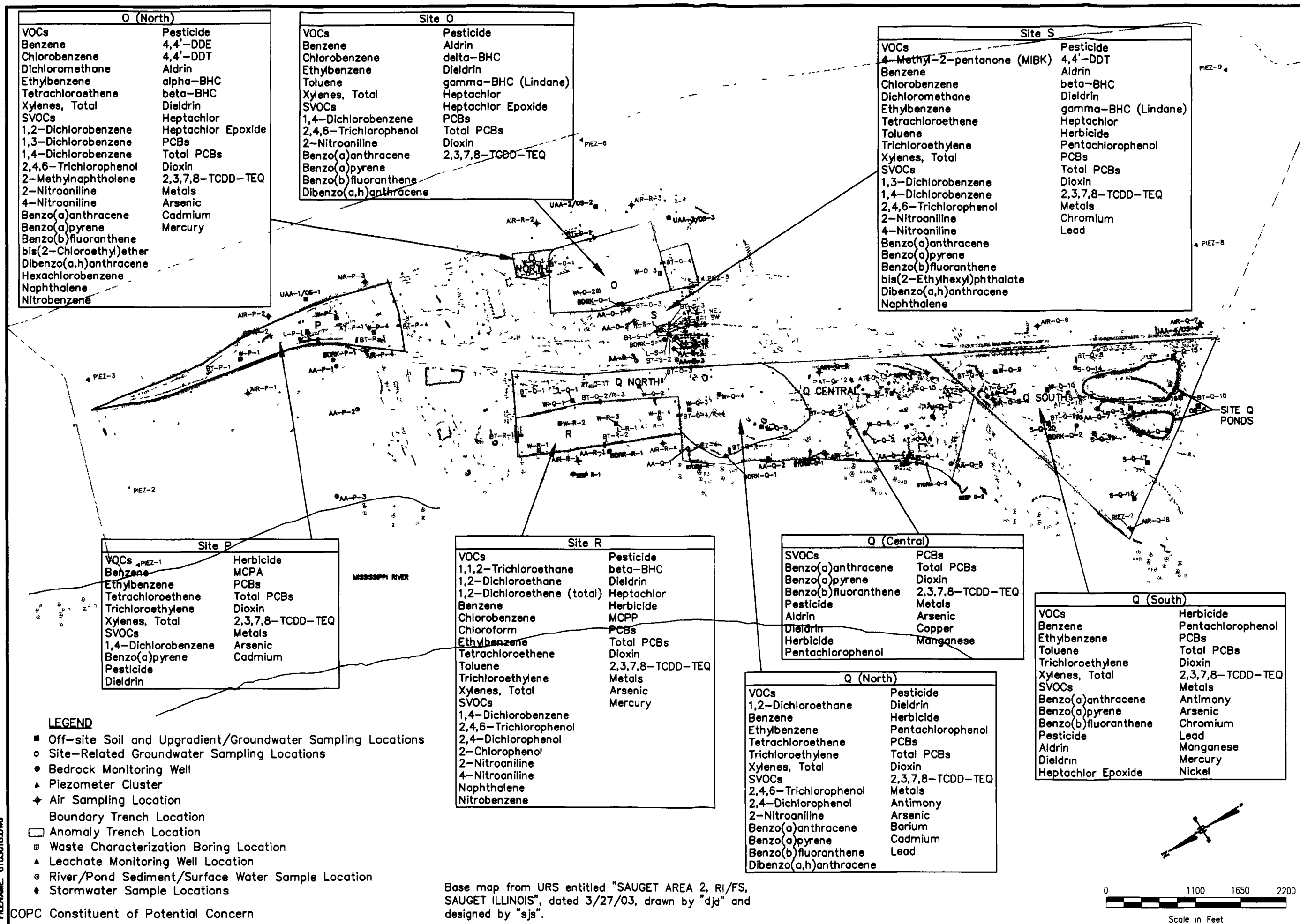
AMBIENT AIR SAMPLE LOCATIONS HUMAN HEALTH RISK ASSESSMENT SAUGET AREA 2 RI/FS SAUGET, IL		
SCALE:	DATE:	PROJECT NUMBER:
1"=1100'	7/03	06105-009

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COPCs IN COMBINED SOILS HUMAN HEALTH RISK ASSESSMENT SAUGET AREA 2 RI/FS SAUGET, IL	
SCALE: 1"=1100'	PROJECT NUMBER: 06105-009
DATE: 7/03	

FIGURE NUMBER: <b>3-8</b>
SHEET NUMBER: X

L-O-1 - Leachate	
VOCs	Pesticide
4-Methyl-2-pentanone (MIBK)	beta-BHC
Benzene	Herbicide
Chlorobenzene	2,4,5-T
SVOCs	2,4-D
2,4,6-Trichlorophenol	Pentachlorophenol
2,4-Dichlorophenol	PCBs
2-Chlorophenol	Total PCBs
2-Nitroaniline	Dioxin
3-Methylphenol/4-Methylphenol	2,3,7,8-TCDD-TEQ
4-Chloroaniline	Metals
4-Nitroaniline	Manganese
Naphthalene	Thallium
Nitrobenzene	
Phenol	

AA-O-1 - Shallow Groundwater	
SVOCs	
Benzo(a)pyrene	
Benzo(b)fluoranthene	
Benzo(k)fluoranthene	
Dibenzo(a,h)anthracene	
Indeno(1,2,3-cd)pyrene	
Metals	
Arsenic	
Lead	
Manganese	

L-R-1 - Leachate	
VOCs	Pesticide
1,2-Dichloroethane	4,4'-DDT
1,2-Dichloroethene (total)	beta-BHC
2-Butanone (MEK)	Dieldrin
Acetone	gamma-BHC (Lindane)
Benzene	Heptachlor
Chlorobenzene	Herbicide
Chloroform	2,4-D
Dichloromethane	PCBs
Tetrachloroethene	Total PCBs
Toluene	Dioxin
Trichloroethylene	2,3,7,8-TCDD-TEQ
SVOCs	Metals
2-Chlorophenol	Beryllium
3-Methylphenol/4-Methylphenol	Chromium
4-Chloroaniline	Cobalt
4-Nitroaniline	Manganese
Benzo(g,h,i)perylene	Mercury
Phenol	Nickel
	Thallium
	Vanadium
	Zinc

AA-S-1  
AA-S-2  
AA-S-3  
Mid-Groundwater  
No COPCs Identified

AA-O-2 - Shallow-Groundwater  
No COPCs Identified

AA-P-1 - Mid-Groundwater  
No COPCs Identified

AA-P-2 - Mid-Groundwater  
No COPCs Identified

AA-P-3 - Mid-Groundwater  
No COPCs Identified

AA-O-3 - Mid-Groundwater  
No COPCs Identified

L-Q-1 - Leachate	
VOCs	Pesticide
1,2-Dichloroethane	beta-BHC
4-Methyl-2-pentanone (MIBK)	Endrin Ketone
Acetone	Herbicide
Benzene	2,4-D
Chlorobenzene	Pentachlorophenol
Dichloromethane	PCBs
Tetrachloroethene	Total PCBs
Trichloroethylene	Metals
SVOCs	Antimony
2,4,6-Trichlorophenol	Manganese
2,4-Dichlorophenol	Nickel
2,4-Dimethylphenol	Zinc
2-Chlorophenol	
2-Nitroaniline	
3-Methylphenol/4-Methylphenol	
4-Chloroaniline	
4-Nitroaniline	
Naphthalene	
Nitrobenzene	
Phenol	

AA-R-1 - Mid-Groundwater	
VOCs	
Benzene	
Chlorobenzene	
Chloromethane	

AA-Q-6 - Mid-Groundwater  
VOCs  
Benzene

AA-Q-7 - Mid-Groundwater  
No COPCs Identified

AA-Q-8 - Mid-Groundwater  
No COPCs Identified

#### LEGEND

- Off-site Soil and Upgradient/Groundwater Sampling Locations
- Site-Related Groundwater Sampling Locations
- Bedrock Monitoring Well
- Piezometer Cluster
- Air Sampling Location
- Boundary Trench Location
- Anomaly Trench Location
- Waste Characterization Boring Location
- Leachate Monitoring Well Location
- River/Pond Sediment/Surface Water Sample Location
- Stormwater Sample Locations

Shallow Groundwater - Less than or equal to 15 feet to water-construction worker contact and volatilization pathways  
Mid Groundwater - Less than or equal to 30 feet to water-volatilization pathway only  
Leachate - Construction worker contact and volatilization pathways

Base map from URS entitled "SAUGET AREA 2, RI/FS, SAUGET ILLINOIS", dated 3/27/03, drawn by "djd" and designed by "sjs".

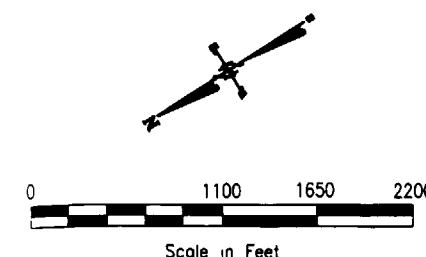
COPC Constituent of Potential Concern

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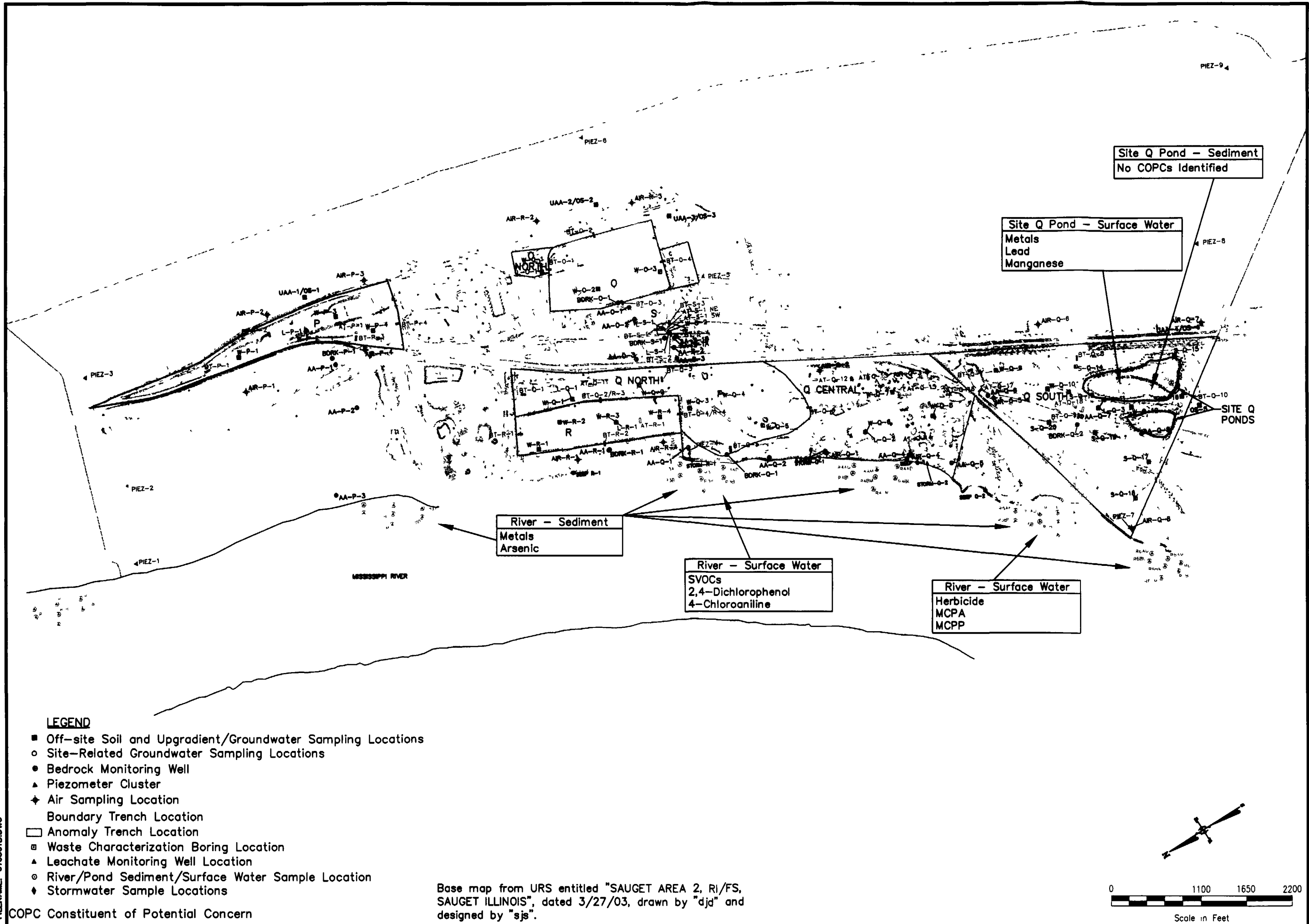
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COPCs IN GROUNDWATER AND LEACHATE HUMAN HEALTH RISK ASSESSMENT SAUGET AREA 2 RI/FS SAUGET, IL	
SCALE: 1"=1100'	PROJECT NUMBER: 06105-009
DATE: 7/03	

FIGURE NUMBER:
3-9
SHEET NUMBER:
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COPCS IN SURFACE WATER & SEDIMENT  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, IL

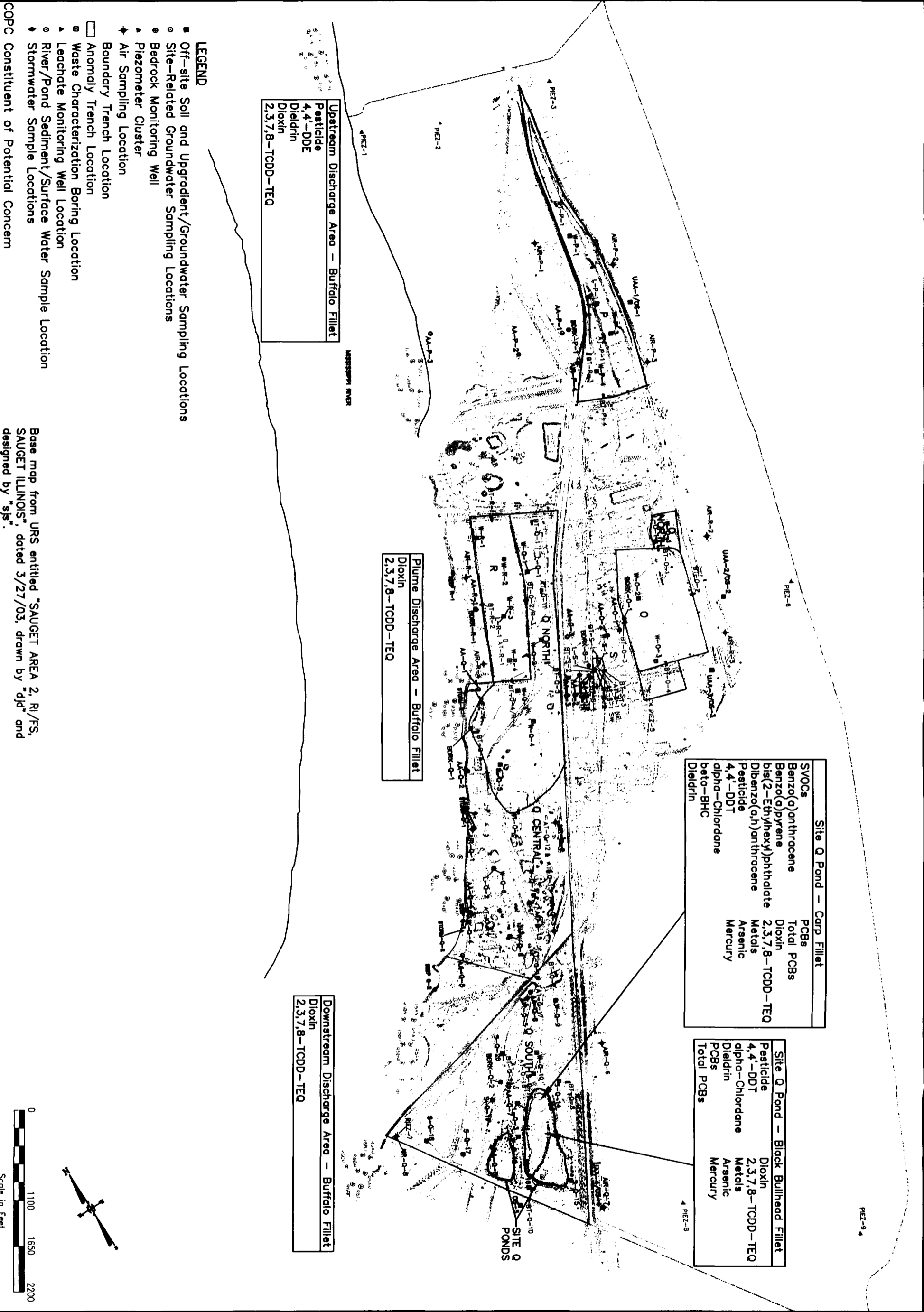
SCALE: 1"=1100'  
DATE: 7/03  
PROJECT NUMBER: 06105-009

FIGURE NUMBER:

**3-10**

SHEET NUMBER:

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COPCs IN FISH FILLET  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, IL

SCALE:	DATE:	PROJECT NUMBER:
1"=1100'	7/03	06105-009

FIGURE NUMBER:

3-11

SHEET NUMBER:

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## 4.0 DOSE-RESPONSE ASSESSMENT

The purpose of the dose-response assessment is to identify the types of adverse health effects a constituent may potentially cause, and to define the relationship between the dose of a constituent and the likelihood or magnitude of an adverse effect (response) (USEPA, 1989a). Adverse effects are classified by USEPA as potentially carcinogenic or noncarcinogenic (i.e., potential effects other than cancer). Dose-response relationships are defined by USEPA for oral exposure and for exposure by inhalation. Oral toxicity values are also used to assess dermal exposures, with appropriate adjustments, because USEPA has not yet developed values for this route of exposure. Combining the results of the toxicity assessment with information on the magnitude of potential human exposure provides an estimate of potential risk.

Numerical toxicity values are generally obtained from USEPA databases/sources. The dose-response relationship is often determined from laboratory studies conducted under controlled conditions with laboratory animals. These laboratory studies are controlled to minimize responses due to confounding variables, and are conducted at relatively high dose levels to ensure that responses can be observed using as few animals as possible in the experiments. Mathematical models or uncertainty factors are used to extrapolate the relatively high doses administered to animals to predict potential human responses at dose levels far below those tested in animals. Humans are typically exposed to *constituents in the environment at levels much lower than those tested in animals*. These low doses may be detoxified or rendered inactive by the myriad of protective mechanisms that are present in humans (Ames et al., 1987) and that may not function at the high dose levels used in animal experiments. Therefore, the results of these animal studies may only be of limited use in accurately predicting a dose-response relationship in humans. However, to be protective of human health, USEPA incorporates many conservative assumptions and safety factors when deriving numerical toxicity criteria from laboratory studies, as discussed below.

This section contains six subsections. Section 4.1 describes the sources of toxicity values. Section 4.2 describes USEPA's approach for developing noncarcinogenic toxicity values. Section 4.3 describes the toxicity values developed by USEPA for the evaluation of potential carcinogenic effects. Section 4.4 discusses PCB dose-response issues, and Section 4.5 discusses dioxin and furan dose-response issues. Section 4.6 introduces absorption adjustment factors (AAFs) used to account for differences in absorption in the environmental medium and in the dose-response study.

### 4.1 Sources of Toxicity Values

Sources of the published toxicity values in this risk assessment include USEPA's Integrated Risk Information System (IRIS) (USEPA, 2003b), the Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997b), and the USEPA National Center for Environmental Assessment (NCEA) in Cincinnati, Ohio.

The primary USEPA source of toxicity values is IRIS, an on-line computer database of toxicological information (USEPA, 2003b). The IRIS toxicity value development process consists of a search of the current literature, development of health assessments and draft IRIS summaries, peer review within USEPA, peer review outside of USEPA, USEPA consensus review and management approval, preparation of final IRIS summaries and supporting documents, and entry of summaries and supporting documents into the IRIS database (USEPA, 2003b).

Another source of toxicity values is the USEPA Health Effects Assessment Summary Tables (HEAST) (USEPA, 1997b). HEAST was published annually by the USEPA and provides a compilation of toxicity values available at the time of publishing. Because HEAST is no longer updated regularly, the toxicity values provided may not represent the most current values available. In addition, the toxicity values provided by HEAST are considered to be provisional, i.e., the value has had some form of agency review, but does not appear on IRIS. The HEAST values may or may not have been generated following the IRIS process, but the values generally use all available information, use current methodology, and a consensus was reached by Agency scientists on the value. HEAST is, therefore, considered to be an unverified source of dose-response values and should be used only if no toxicity value is available on IRIS.

When a toxicity value is not available from IRIS or HEAST, the USEPA NCEA in Cincinnati may be consulted for provisional toxicity values. These toxicity values may or may not meet the HEAST criteria. The NCEA generally provides a toxicological summary for the value. The USEPA Region 3 RBC Table (USEPA, 2003a) and the USEPA Region 9 PRG Table (USEPA, 2002b) also use toxicity information from NCEA where available, and can serve as a source of these values.

Therefore, the hierarchy of toxicity value sources correlates in general with the level of confidence in the values, with the values directly provided by NCEA having the lowest level of scientific review and approval and, thus, the least level of confidence. NCEA provided toxicity values for several COPCs, as indicated in dose response tables (Table 4-1 to Table 4-4).

#### **4.2 Noncarcinogenic Toxicity Assessment**

Constituents with known or potential noncarcinogenic effects are assumed to have a dose below which no adverse effect occurs or, conversely, above which an adverse effect may be seen. This dose is called the threshold dose. A conservative estimate of the true threshold dose is called a No Observed Adverse Effect Level (NOAEL). The lowest dose at which an adverse effect has been observed is called a Lowest Observed Adverse Effect Level (LOAEL). By applying uncertainty factors to the NOAEL or the LOAEL, Reference Doses (RfDs) for chronic exposure to constituents with noncarcinogenic effects have been developed by USEPA (1997b, 2003b).

In regulatory toxicity assessment, USEPA assumes that humans are as sensitive, or more sensitive, to the toxic effects of a constituent as the most sensitive species used in the laboratory studies. Moreover, the RfD is developed based on the most sensitive or critical adverse health effect observed in the study population, with the assumption that if the most critical effect is prevented, then all other potential toxic effects are prevented. Uncertainty factors are applied to the NOAEL (or LOAEL, when a NOAEL is unavailable) for this critical effect to account for uncertainties associated with the dose-response relationship. These include using an animal study to derive a human toxicity value, extrapolating from a LOAEL to a NOAEL, extrapolating from a subchronic (partial lifetime) to a chronic lifetime exposure, and evaluating sensitive subpopulations. Generally, a 10-fold factor is used to account for each of these uncertainties; thus, the total uncertainty factor can range from 10 to 10,000. In addition, an uncertainty factor or a modifying factor of up to 10 can be used to account for inadequacies in the database or other uncertainties. The resulting RfDs are very conservative, i.e., health protective, because of the use of the large uncertainty factors. For constituents with noncarcinogenic effects, an RfD provides reasonable certainty that no noncarcinogenic health effects are expected to occur even if daily exposures were to occur at the RfD level for a lifetime. RfDs and exposure doses are expressed in units of milligrams of a constituent per kilogram of body weight per day (mg/kg-day). The lower the RfD value, the lower is the assumed threshold for effects, and the greater the assumed toxicity.

Table 4-1 summarizes the toxicity information for COPCs with potential noncarcinogenic effects for the oral route of exposure. For each COPC, the chemical abstracts service number (CAS number), the dose-response value (RfD), and the reference for the toxicity value are presented. In addition, the USEPA confidence level in the value, the uncertainty factor, the modifying factor, the study animal, study method, target organ and critical effect upon which the toxicity value is based are also presented for each COPC, where available. The confidence level is provided for constituents with toxicity values published on IRIS and for constituents with toxicity values provided by NCEA, and is based on the confidence in the study and the extent of toxicity information available for that constituent.

Table 4-2 summarizes the toxicity information for COPCs with potential noncarcinogenic effects for the inhalation route of exposure. For each COPC, the CAS number and the toxicity value are presented. Inhalation RfD (in units of mg/kg-day) values are calculated from Reference Concentrations (RfC) (in units of mg/m<sup>3</sup>) assuming a 70 kg adult breathes 20 m<sup>3</sup> of air per day. Both values are presented where available. In addition, the reference for the toxicity value, the USEPA confidence level in the value, the uncertainty factor, the modifying factor, the study animal, study method, target organ and critical effect upon which the toxicity value is based are also presented for each constituent. Due to the great uncertainties involved, USEPA generally does not support use of oral toxicity values to evaluate inhalation exposures (USEPA, 1994).

### 4.3 Carcinogenic Toxicity Assessment

In assessing the carcinogenic potential of a constituent, the Human Health Assessment Group of USEPA has classified constituents into one of the following groups (USEPA, 1986, 1997b), according to the weight of evidence from epidemiologic and animal studies:

- |         |  |
|---------|--|
| Group A | - Human Carcinogen (sufficient evidence of carcinogenicity in humans)  |
| Group B | - Probable Human Carcinogen (B1 - limited evidence of carcinogenicity in humans; B2 - sufficient evidence of carcinogenicity in animals with inadequate or lack of evidence in humans) |
| Group C | - Possible Human Carcinogen (limited evidence of carcinogenicity in animals and inadequate or lack of human data)  |
| Group D | - Not Classifiable as to Human Carcinogenicity (inadequate or no evidence)   |
| Group E | - Evidence of Noncarcinogenicity for Humans (no evidence of carcinogenicity in adequate studies)   |

The underlying assumption of regulatory risk characterization for constituents with known or assumed potential carcinogenic effects is that no threshold dose exists. Thus, the characterization assumes that there is some finite level of risk associated with each non-zero dose. The USEPA has developed computerized models that extrapolate dose-response relations observed at the relatively high doses used in animal studies to the low dose levels encountered by humans in environmental situations. The mathematical models developed by USEPA assume no threshold, and use both animal and human data (where available) to develop a potency estimate for a given constituent. The potency estimate, called a cancer slope factor (CSF) is expressed in units of (mg/kg-day)<sup>-1</sup>; the higher the CSF, the greater the carcinogenic potential.

While USEPA has published drafts of revised Guidelines for Carcinogen Risk Assessment (USEPA, 1996c, 1999, 2003d), these have not yet been finalized. The major changes in the guidelines from those published in 1986 (USEPA, 1986) include:

- Replacing the alphanumeric classification system with a weight-of-evidence narrative and providing three descriptors (known/likely, cannot be determined, and not likely);
- Emphasizing the agent's mode of action;

- Use of biologically-based extrapolation models is the preferred approach where tumor response is modeled within the range of observation and an initial identification of a point of departure for low-dose extrapolation is identified (generally the dose corresponding to the lower 95% limit on a dose associated with a 10% response - the LED10); and
- Providing three default low-dose extrapolation approaches: the original linear approach, a nonlinear approach (using a margin of exposure - MOE), or both.

While these represent important advances in carcinogen risk assessment, the approach has not generally been implemented for constituents with toxicity values on IRIS. Therefore, the alphanumeric system is still presented on IRIS and is included here.

Table 4-3 summarizes the toxicity information for COPCs classified by the USEPA as potential carcinogens for the oral route of exposure. For each constituent, the CAS number, USEPA carcinogenicity class, the oral cancer-slope factor and the reference are provided. In addition, the study animal and route of exposure upon which the CSF is based are presented.

Table 4-4 summarizes the toxicity information for COPCs classified by the USEPA as potential carcinogens for the inhalation route of exposure. For each constituent, the CAS number, USEPA carcinogenicity class, the inhalation cancer slope factor and unit risk factor (provided in units of  $(\mu\text{g}/\text{m}^3)^{-1}$ ) and the reference are provided. In addition, the study animal and route of exposure upon which the CSF is based are presented. The CSF is calculated from the unit risk assuming a 70 kg adult breathes 20  $\text{m}^3$  of air per day.

#### 4.4 PCB Dose-Response

The biphenyl structure of PCBs consists of two aromatic 6-member rings connected by a single bond. There are five locations on each ring that can be chlorinated, and there are 209 individual PCB congeners, each identified by a unique congener number. Structurally, PCB congeners can be classified into groups based on the number of chlorines per molecule (e.g., monochloro-, dichloro-, trichloro-, up to decachloro-biphenyl). These groups are referred to as homologs.

Aroclor mixtures are the commercial mixtures of PCBs that were used in industry. The Aroclors are identified numerically (e.g., Aroclor 1260, Aroclor 1016). The higher the Aroclor number, the more enriched is the mixture in congeners containing higher numbers of chlorines. Each Aroclor mixture exhibits a characteristic, however overlapping, range of congeners, and Aroclors are identified and quantitated in samples by comparing the sample results to Aroclor standards.

Total PCBs in a sample can be calculated by summing the Aroclor concentrations. Alternatively, PCBs can be quantitated by homolog and the homolog concentrations summed to give a total PCB concentration. This latter method was used in the Sauget Area 2 risk assessment.

Risks from potential exposures to PCBs have been calculated using the most current guidance available from USEPA. Currently, USEPA-approved guidance is provided in IRIS (USEPA, 2003b). Total PCB concentrations were calculated for each sample by summing the separate homolog concentrations. The total PCB concentrations were used to calculate the PCB exposure dose to be combined with the verified cancer slope factors listed in IRIS (USEPA, 2003b). Guidance provided in IRIS specifies three tiers of human slope factors for environmental PCBs: high risk and persistence, low risk and persistence, and lowest risk and persistence. The choice of slope factors for use depends on the medium of exposure and PCB chlorine content, as outlined in IRIS (USEPA, 2003b). These values are presented in Table 4-5. Based on a review of the media evaluated in the risk assessment and the CSF selection criteria, the CSF value of 2 (mg/kg-day)<sup>-1</sup> was used in the Sauget Area 2 risk assessment, which is the slope factor for high risk and persistence PCBs.

Non-cancer risks from potential exposures to PCBs were calculated using the most conservative RfD for a PCB mixture, the oral reference dose for Aroclor 1254 of 2E-05 mg/kg-day.

#### **4.5 Dioxin and Furan Dose-Response**

The potential carcinogenic effects associated with exposure to dioxin and furan congeners in environmental media were assessed in accordance with the approach developed by USEPA (1989b). Risks were calculated for 2,3,7,8-tetrachloro-dibenzo-p-dioxin (2,3,7,8-TCDD) and the dioxin and furan congeners using the cancer slope factor for 2,3,7,8-TCDD listed in HEAST and using the toxic equivalency factors (TEFs) provided by World Health Organization (WHO) (Van den Berg et al., 1998). The TEFs are fractions that equate the potential toxicity of each congener to that of 2,3,7,8-TCDD. The TEFs are listed in Table 4-6. For each sample, the reported sample concentration (or half the detection limit, as appropriate, for non-detected congeners) for each dioxin and furan congener having a TEF listed by WHO was multiplied by its TEF, resulting in a dioxin toxic equivalent concentration (Dioxin TEQ). The Dioxin TEQ values for each of the congeners were then added together for each sample and treated as one sample concentration in the risk assessment. The cancer slope factor for 2,3,7,8-TCDD was used to calculate potential carcinogenic risks resulting from potential exposure to Dioxin TEQs.

#### **4.6 Absorption Adjustment Factors**

Differences exist in absorption between humans in an environmental situation and the animals generally used in the studies to develop the dose-response values. Absorption Adjustment Factors

(AAFs) are used in a risk assessment to account for these differences. AAFs are discussed in greater detail in Section 5.5.1 and Appendix H.

**TABLE 4-1**  
**DOSE-RESPONSE INFORMATION FOR CONSTITUENTS WITH POTENTIAL NONCARCINOGENIC EFFECTS FROM CHRONIC EXPOSURE THROUGH THE ORAL ROUTE**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RIFS**  
**SAUGET, ILLINOIS**

Constituent	CAS Number	Oral Dose-Response Value (mg/kg-day)	Reference (Last Verified) Type	EPA Confidence Level	Uncertainty Factor	Modifying Factor	Target Organ/Critical Effect at LOAEL	Study Animal	Study Method
<b>VOCs</b>									
1,1,2-Trichloroethane	78-00-6	4.00E-03	IRIS (5/2003)	MEDIUM	1000	1	Clinical serum chemistry	MOUSE	ORAL-DRINKING WATER
1,2-Dichloroethane	107-06-2	2.00E-02	NCEA (10/02)	MEDIUM	3000	1	Increased kidney weight	RAT	ORAL-DRINKING WATER
1,2-Dichloroethane (total)	540-69-0	2.00E-02 (a)	IRIS (5/2003)	LOW	1000	1	Increased serum alkaline phosphatase in mice	MOUSE	ORAL-DRINKING WATER
2-Butanone (MEK)	78-93-3	6.00E-01	IRIS (5/2003)	LOW	3000	1	Decreased fetal birth weight	RAT	ORAL-DRINKING WATER
4-Methyl-2-pentanone (MIBK)	106-10-1	8.00E-02	HEAST (1997)	NA	3000	1	Increased liver and kidney weights, increased urinary protein, lethargy	RAT	ORAL-GAVAGE
Acetone	67-64-1	1.00E-01	IRIS (5/2003)	LOW	1000	1	Increased liver and kidney weights and nephrotoxicity	RAT	ORAL-GAVAGE
Benzene	71-43-2	4.00E-03	IRIS (5/2003)	MEDIUM	300	1	Decreased lymphocyte count	HUMAN	OCCUPATIONAL-INHALATION
Chlorobenzene	108-90-7	2.00E-02	IRIS (5/2003)	MEDIUM	1000	1	Histopathologic changes in liver	DOG	ORAL-CAPSULE
Chloroform	67-66-3	1.00E-02	IRIS (5/2003)	MEDIUM	1000	1	Fatty cyst formation in liver and elevated SGTP	DOG	ORAL-CAPSULE
Chloromethane	74-87-3	NA	NA	NA	NA	NA	NA	NA	NA
Dichloromethane	78-09-2	6.00E-02	IRIS (5/2003)	MEDIUM	100	1	Liver toxicity	RAT	ORAL-DRINKING WATER
Ethylbenzene	100-41-4	1.00E-01	IRIS (5/2003)	LOW	1000	1	Liver and kidney toxicity	RAT	ORAL-GAVAGE
Tetrachloroethene	127-18-4	1.00E-02	IRIS (5/2003)	MEDIUM	1000	1	Hepatotoxicity in mice, decreased weight gain in rats	MOUSE/RAT	ORAL-GAVAGE/DRINKING WATER
Toluene	108-88-3	2.00E-01	IRIS (5/2003)	MEDIUM	1000	1	Changes in liver and kidney weights	RAT	ORAL-GAVAGE
Trichloroethylene	79-01-6	3.00E-04	(b)	LOW	3000	1	Increased relative liver weight	MOUSE	ORAL-DRINKING WATER
Xylenes, Total	1330-20-7	2.00E-01	IRIS (5/2003)	MEDIUM	1000	1	Decreased body weight, increased mortality	RAT	ORAL-GAVAGE
<b>SVOCs</b>									
1,2-Dichlorobenzene	96-60-1	9.00E-02	IRIS (5/2003)	LOW	1000	1	No adverse effects observed	RAT	ORAL-GAVAGE
1,3-Dichlorobenzene	541-73-1	8.00E-04	NCEA (1/4/98)	LOW	10000	NA	Hematological and thyroid effects	RAT	ORAL-GAVAGE
1,4-Dichlorobenzene	106-46-7	3.00E-02	NCEA (4/28/97)	MEDIUM	1000	1	Liver perturbations and developmental toxicity effects	RAT	ORAL-GAVAGE
2,4,6-Trichlorophenol	88-06-2	1.00E-04	NCEA (8/2000)	LOW	3000	1	Reproductive effects	RAT	ORAL-DRINKING WATER
2,4-Dichlorophenol	120-83-2	3.00E-03	IRIS (5/2003)	LOW	100	1	Decreased delayed hypersensitivity response	RAT	ORAL-DRINKING WATER
2,4-Dimethylphenol	106-67-9	2.00E-02	IRIS (5/2003)	LOW	3000	1	Clinical signs (lethargy, prostration, and ataxia) and hematological changes	MOUSE	ORAL-GAVAGE
2-Chlorophenol	95-57-8	5.00E-03	IRIS (5/2003)	LOW	1000	1	Reproductive effects	RAT	ORAL-DRINKING WATER
2-Methylnaphthalene	91-57-6	2.00E-02 (c)	IRIS (5/2003)	LOW	3000	1	Decreased body weight in males	RAT	ORAL-GAVAGE
2-Nitroaniline	88-74-4	NA	NA	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methylphenol	(d)	5.00E-02 (e)	IRIS (5/2003)	MEDIUM	1000	1	Decreased body weight, neurotoxicity	RAT	ORAL-GAVAGE
4-Chloroaniline	106-47-8	4.00E-03	IRIS (5/2003)	LOW	3000	1	Nonneoplastic lesions of splenic capsule	RAT	ORAL-DIET
4-Nitroaniline	100-01-8	3.00E-03	NCEA (11/1/02)	HIGH	100	1	Hematological effects	RAT	ORAL-GAVAGE
Benzo(a)anthracene	56-56-3	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	50-32-8	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)fluoranthene	205-99-2	NA	NA	NA	NA	NA	NA	NA	NA

**TABLE 4-1  
DOSE-RESPONSE INFORMATION FOR CONSTITUENTS WITH POTENTIAL NONCARCINOGENIC EFFECTS FROM CHRONIC EXPOSURE THROUGH THE ORAL ROUTE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RMP/S  
SAUGET, ILLINOIS**

Constituent	CAS Number	Oral Dose-Response Value (mg/kg-day)	Reference (Last Verified) Type	SPA Confidence Level	Uncertainty Factor	Modifying Factor	Target Organ/Critical Effect at LOAEL	Study Animal	Study Method		
SVOCs Cont.											
Benzo(g,h,i)perylene	191-24-2	3.00E-02	(f)	IRIS (5/2003)	HIGH	3000	1	Kidney effects	MOUSE	ORAL-GAVAGE	
Benzo(k)fluoranthene	207-08-8	NA		NA	NA	NA	NA	NA	NA	NA	
bis(2-Chloroethyl)ether	111-44-4	NA		NA	NA	NA	NA	NA	NA	NA	
bis(2-Ethylhexyl)phthalate	117-81-7	2.00E-02	IRIS (5/2003)	MEDIUM	1000	1	Increased relative liver weight	GUINEA PIG	ORAL-DIET		
Obenzo(a,h)anthracene	53-70-3	NA		NA	NA	NA	NA	NA	NA	NA	
Hexachlorobenzene	118-74-1	8.00E-04	IRIS (5/2003)	MEDIUM	100	1	Liver effects	RAT	ORAL-DIET		
Indeno(1,2,3-cd)pyrene	183-38-8	NA		NA	NA	NA	NA	NA	NA	NA	
Naphthalene	91-20-3	2.00E-02	IRIS (5/2003)	LOW	3000	1	Decreased body weight in males	RAT	ORAL-GAVAGE		
Nitrobenzene	98-96-3	6.00E-04	IRIS (5/2003)	LOW	10000	1	Hematologic effects, and adrenal, renal & hepatic lesions	RAT/MOUSE	INHALATION		
Phenol	108-95-2	3.00E-01	IRIS (5/2003)	MEDIUM-HIGH	300	1	Decreased maternal weight gain	RAT	ORAL-GAVAGE		
Pesticides											
4,4'-DDE	72-86-8	6.00E-04	(g)	IRIS (5/2003)	MEDIUM	100	1	Liver lesions	RAT	ORAL-DIET	
4,4'-DDT	80-29-3	6.00E-04	IRIS (5/2003)	MEDIUM	100	1	Liver lesions	RAT	ORAL-DIET		
Aldrin	308-00-2	3.00E-06	IRIS (5/2003)	MEDIUM	1000	1	Liver toxicity	RAT	ORAL-DIET		
alpha-BHC	318-84-8	3.00E-04	(f)	IRIS (5/2003)	MEDIUM	1000	1	Liver and kidney toxicity	RAT	ORAL-DIET	
alpha-Chlordane	5103-71-8	6.00E-04	(h)	IRIS (5/2003)	MEDIUM	300	1	Hepatic necrosis	MOUSE	ORAL-DIET	
beta-BHC	318-85-7	3.00E-04	(f)	IRIS (5/2003)	MEDIUM	1000	1	Liver and kidney toxicity	RAT	ORAL-DIET	
delta-BHC	318-86-8	3.00E-04	(f)	IRIS (5/2003)	MEDIUM	1000	1	Liver and kidney toxicity	RAT	ORAL-DIET	
Dieldrin	80-67-1	6.00E-06	IRIS (5/2003)	MEDIUM	100	1	Liver lesions	RAT	ORAL-DIET		
Endrin Ketone	53494-70-8	3.00E-04	(i)	IRIS (5/2003)	MEDIUM	100	1	Mild histological lesions in liver, occasional convulsions	DOG	ORAL-DIET	
gamma-BHC (Lindane)	58-80-6	3.00E-04	IRIS (5/2003)	MEDIUM	1000	1	Liver and kidney toxicity	RAT	ORAL-DIET		
Heptachlor	76-44-8	6.00E-04	IRIS (5/2003)	LOW	300	1	Increased liver weight	RAT	ORAL-DIET		
Heptachlor epoxide	1024-87-3	1.30E-06	IRIS (5/2003)	LOW	1000	1	Increased liver to body-weight ratios	DOG	ORAL-DIET		
Herbicides											
2,4,5-T	93-78-6	1.00E-02	IRIS (5/2003)	MEDIUM	300	1	Increased urinary coproporphyrins	RAT	ORAL-DIET		
2,4-D	94-75-7	1.00E-02	IRIS (5/2003)	MEDIUM	100	1	Hematologic, hepatic and renal toxicity	RAT	ORAL-DIET		
MCPA	94-74-8	6.00E-04	IRIS (5/2003)	MEDIUM	300	1	Liver and kidney toxicity	DOG	ORAL		
MCPP	93-85-2	1.00E-03	IRIS (5/2003)	MEDIUM	3000	1	Increased absolute and relative kidney weights	RAT	ORAL-DIET		
Pentachlorophenol	87-86-6	3.00E-02	IRIS (5/2003)	MEDIUM	100	1	Liver & kidney pathology	RAT	ORAL-DIET		
PCBs											
Total PCBs	1336-36-3	2.00E-06	(k)	IRIS (5/2003)	MEDIUM	300	1	Ocular, mammary gland, liver and thyroid, and immune effects	MONKEY	ORAL-CAPSULE	
Dioxin											
2,3,7,8-TCDD-TEQ	1748-01-9	NA	NA	NA	NA	NA	NA	NA	NA	NA	

**TABLE 4-1**  
**DOSE-RESPONSE INFORMATION FOR CONSTITUENTS WITH POTENTIAL NONCARCINOGENIC EFFECTS FROM CHRONIC EXPOSURE THROUGH THE ORAL ROUTE**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 R/F8**  
**SAUGET, ILLINOIS**

Constituent	CAS Number	Oral Dose-Response Value (mg/kg-day)	Reference (Last Verified) Type	EPA Confidence Level	Uncertainty Factor	Modifying Factor	Target Organ/Critical Effect at LOAEL	Study Animal	Study Method
<b>Metals</b>									
Antimony	7440-36-0	4.00E-04	IRIS (5/2003)	LOW	1000	1	Decreased longevity, dec. blood glucose and cholesterol changes	RAT	ORAL-DRINKING WATER
Arsenic	7440-38-2	3.00E-04	IRIS (5/2003)	MEDIUM	3	1	Hyperpigmentation and keratosis of the skin and poss. vascular complications	HUMAN	ORAL-DRINKING WATER
Barium	7440-36-3	7.00E-02	IRIS (5/2003)	MEDIUM	3	1	Increased kidney weight	HUMAN	ORAL-DRINKING WATER
Beryllium	7440-41-7	2.00E-03	IRIS (5/2003)	LOW/MEDIUM	300	1	Small intestinal lesions	DOG	ORAL-DIET
Cadmium	7440-43-8	1.00E-03 (f)	IRIS (5/2003)	HIGH	10	1	Proteinuria	HUMAN	ORAL
Chromium	7440-47-3	3.00E-03 (m)	IRIS (5/2003)	LOW	300	3	Nause reported	RAT	ORAL-DRINKING WATER
Cobalt	7440-48-4	2.00E-02	NCEA (1/19/02)	LOW/MEDIUM	10	1	Hematological	HUMAN	INJECTION (DIALYSIS)
Copper	7440-50-8	3.70E-02	HEAST (1997)	NA	NA	NA	GI irritation	HUMAN	ORAL
Lead	7439-92-1	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-6	2.40E-02 (n)	IRIS (5/2003)	MEDIUM	1	3	CNS Effects	HUMAN	ORAL-DIET
Mercury	7439-97-6	3.00E-04 (o)	IRIS (5/2003)	HIGH	1000	1	Autoimmune effects	RAT	ORAL
Nickel	7440-02-0	2.00E-02	IRIS (5/2003)	MEDIUM	300	1	Decreased body & organ weights	RAT	ORAL-DIET
Thallium	7440-28-0	6.87E-05 (p)	IRIS (5/2003)	LOW	3000	1	Increased levels of SGOT and LDH	RAT	ORAL-DIET
Vanadium	7440-62-2	7.00E-03	HEAST (1997)	NA	100	1	No effects reported	RAT	ORAL-DRINKING WATER
Zinc	7440-66-8	3.00E-01	IRIS (5/2003)	MEDIUM	3	1	Hematologic effects	HUMAN	ORAL-DIET SUPPLEMENT

**Notes:**

CAS - Chemical Abstracts Service.

LOAEL - Lowest Observed Adverse Effects Level.

HEAST - Health Effects Assessment Summary Tables, published annually by the USEPA (1997b).

IRIS - Integrated Risk Information System, an on-line computer database of toxicological information (USEPA, 2003b).

NCEA - National Center for Environmental Assessment.

NOAEL - No Observed Adverse Effects Level.

PRG - Preliminary Remediation Goal Table (10/2002) (USEPA, 2002b).

RBC - Risk Based Concentration Table (4/2003) (USEPA, 2003a).

RfD - Reference Dose.

USEPA - United States Environmental Protection Agency.

(a) Value for trans 1,2-Dichloroethene.

(b) Trichloroethylene Health Risk Assessment Synthesis and Characterization. EPA/600/p-01/002A August 2001. Personal communication (USEPA, July 9, 2003).

(c) Value for Naphthalene.

(d) The CAS numbers for 3-Methylphenol and 4-Methylphenol are 108-44-5 and 108-36-4, respectively.

(e) Oral Dose Response value for 3-Methylphenol is used. No IRIS value available for 4-Methylphenol.

(f) Value for Pyrene.

(g) Value for DDT.

(h) Value for Chlordane.

(i) Value for gamma-BHC used due to structural similarities.

(j) Value for Endrin.

(k) Value for Aroclor 1254 (IRIS) (USEPA, 2003b).

(l) Cadmium is a constituent of potential concern in soil only. Therefore, the reference dose for food rather than the reference dose for water is used.

(m) Chromium is evaluated using the dose-response data for Hexavalent Chromium.

(n) When assessing exposure to manganese in soil or drinking water, IRIS (5/2003) recommends applying a modifying factor of 3 to the oral RfD of 0.14 mg/kg-day. The USEPA Region 9 PRG table (USEPA, 2002b) also indicates that the average dietary manganese content of the US diet (8 mg/day) be subtracted from the critical dose of 10 mg/day. Therefore, the RfD is (10 mg/day - 8 mg/day)/Modifying Factor (3) = 1.67 mg/day / 70 kg = 0.024 mg/kg-day.

(o) Value for Mercury chloride.

(p) The NOAEL of 0.25 mg/kg-day for Thallium Sulfate (IRIS, 5/2003) was adjusted for the molecular weight of Thallium (see the Thallium Acetate IRIS file (5/2003)) to 0.20 mg/kg-day. Therefore, the Thallium RfD = 0.20 mg/kg-day / UF 3000 = 6.67E-05 mg/kg-day.

TABLE 4-2  
DOSE-RESPONSE INFORMATION FOR CONSTITUENTS WITH POTENTIAL NONCARCINOGENIC EFFECTS THROUGH THE INHALATION ROUTE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/F3  
SAUGET, ILLINOIS

Constituent	CAS Number	Inhalation Dose-Response Value (mg/kg-day)	Inhalation Reference Concentration (mg/m <sup>3</sup> )	Reference (Last Verified) Type	BPA Confidence Level	Uncertainty Factor	Modifying Factor	Target Organ/Critical Effect at LOAEL	Study Animal	Study Method
VOCs										
1,1,2-Trichloroethane	78-00-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichloroethane	107-06-2	1.40E-03	(a)	5.00E-03	NCEA (4/6/93)	LOW	3000	NA	MOUSE	INHALATION
1,2-Dichloroethane (total)	540-69-0	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	78-03-3	2.88E-01	(a)	1.00E+00	IRIS (5/2003)	LOW	1000	3	MOUSE	INHALATION
4-Methyl-2-pentanone (MIBK)	109-10-1	2.87E-01	(a)	3.00E+00	IRIS (5/2003)	LOW/MEDIUM	300	1	RAT/MOUSE	INHALATION
Acetone	67-64-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	71-43-2	2.87E-02	(a)	3.00E-02	IRIS (5/2003)	MEDIUM	300	1	HUMAN	INHALATION/OCCUP
Chlorobenzene	108-90-7	1.70E-02	(a)	6.00E-02	NCEA (9/19/98)	MEDIUM	1000	NA	RAT	INHALATION
Chloroform	67-68-2	1.43E-02	(a)	8.00E-02	NCEA (1/23/93)	LOW/MEDIUM	100	NA	MOUSE	INHALATION
Chloroethane	74-87-3	2.87E-02	(a)	8.00E-02	IRIS (5/2003)	MEDIUM	1000	1	MOUSE	INHALATION
Dichloromethane	75-08-2	8.00E-01	(a)	3.00E+00	HEAST (1997)	NA	100	NA	RAT	INHALATION/INTER
Ethylbenzene	109-41-4	2.88E-01	(a)	1.00E+00	IRIS (5/2003)	LOW	300	1	RAT/RABBIT	INHALATION
Tetrachloroethane	127-18-4	1.70E-01	(a)	6.00E-01	NCEA (9/29/97)	MEDIUM	30	1	MOUSE	INHALATION
Toluene	108-88-3	1.14E-01	(a)	4.00E-01	IRIS (5/2003)	MEDIUM	300	1	HUMAN	INHALATION/OCCUP
Trichloroethylene	79-01-6	1.80E-02	(a)	4.00E-02	(b)	NA	1000	1	HUMAN	INHALATION/OCCUP
Xylenes, Total	1330-20-7	2.88E-02	(a)	1.00E-01	IRIS (5/2003)	MEDIUM	300	1	RAT	INHALATION
BVOCs										
1,2-Dichlorobenzene	96-64-1	8.70E-02	(a)	2.00E-01	HEAST (1997)	NA	1000	1	RAT	INHALATION/INTER
1,3-Dichlorobenzene	941-73-1	2.29E-01	(a)	6.00E-01	IRIS (5/2003)	MEDIUM	100	1	RAT	INHALATION
1,4-Dichlorobenzene	106-46-7	2.29E-01	(a)	6.00E-01	IRIS (5/2003)	MEDIUM	100	1	RAT	INHALATION
2,4,6-Trichlorophenol	88-06-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	120-43-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	106-47-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	96-47-4	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	91-67-6	8.57E-04	(d)	3.00E-03	IRIS (5/2003)	MEDIUM	3000	1	MOUSE	INHALATION
2-Nitroaniline	86-74-4	6.71E-06	(a)	2.00E-04	HEAST (1997)	NA	10000	1	RAT	INHALATION/INTER
3-Methylphenol (3-Methylphenol)	(a)	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenol	106-47-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	100-01-6	1.14E-03	(a)	4.00E-03	NCEA (11/1/92)	LOW	1000	1	RAT	INHALATION/INTER
Benz(a)anthracene	30-66-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benz(a)pyrene	50-33-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benz(b)fluoranthene	208-96-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benz(g,h,i)perylene	191-34-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benz(k)fluoranthene	207-08-9	NA	NA	NA	NA	NA	NA	NA	NA	NA
ben(3-Chloromethyl)pyrene	111-44-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
ben(2-Ethylmethyl)pyrene	117-81-7	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chen(a,h)anthracene	53-79-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzene	119-74-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indene(1,2,3-cd)pyrene	183-39-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	91-30-3	8.57E-04	(a)	3.00E-03	IRIS (5/2003)	MEDIUM	3000	1	MOUSE	INHALATION
Nitrobenzene	98-06-3	8.70E-04	(a)	2.00E-03	HEAST (1997)	NA	10000	NA	MOUSE/RAT	INHALATION/INTER
Phenol	108-95-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Polycyclic Aromatic Hydrocarbons										
4,4'-DDE	72-66-9	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4'-DDE	50-39-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor	309-00-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-BHC	319-84-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
alpha-Chlordane	5103-71-6	2.00E-04	(a,f)	7.00E-04	IRIS (5/2003)	LOW	1000	1	RAT	INHALATION
beta-BHC	319-86-7	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	319-88-8	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 4-2  
DOSE-RESPONSE INFORMATION FOR CONSTITUENTS WITH POTENTIAL NONCARCINOGENIC EFFECTS THROUGH THE INHALATION ROUTE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RVFS  
SAUGET, ILLINOIS

Constituent	CAS Number	Inhalation Dose-Response Value (mg/kg-day)	Inhalation Reference Concentration (mg/m <sup>3</sup> )	Reference (Last Verified) Type	RFA Confidence Level	Uncertainty Factor	Modifying Factor	Target Organ/Critical Effect at LOAEL	Study Animal	Study Method
Dieldrin	66-67-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	53464-70-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	58-66-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	75-44-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	1034-67-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachloride										
2,4,5-T	53-75-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-D	94-75-7	NA	NA	NA	NA	NA	NA	NA	NA	NA
MCPA	94-74-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
MCPP	93-66-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	87-46-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
PCBs										
Total PCBs	1336-36-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
bleach										
2,3,7,8-TCDD-TEQ	1746-01-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals										
Antimony	7440-36-0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	7440-39-3	1.40E-04 (a)	5.00E-04	HEAST (1987)	NA	1000	NA	NA	NA	NA
Beryllium	7440-41-7	5.71E-06 (a)	2.00E-06	IRIS (8/2003)	MEDIUM	10	1	NA	HUMAN	INHALATION-INTER.
Cadmium	7440-43-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	7440-47-3	2.89E-05 (a,g)	1.00E-04	IRIS (5/2003)	MEDIUM	300	1	NA	NA	NA
Cobalt	7440-48-4	5.70E-06	2.00E-06	NCEA (1/16/92)	MEDIUM/LOW	100	NA	NA	HUMAN	INHALATION-OCCUP.
Copper	7440-49-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	7439-92-1	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	7439-96-4	1.43E-06 (a)	5.00E-06	IRIS (5/2003)	MEDIUM	1000	1	NA	HUMAN	INHALATION
Mercury	7439-97-6	5.87E-06 (a)	3.00E-04	IRIS (5/2003)	MEDIUM	30	1	NA	HUMAN	INHALATION-OCCUP.
Nickel	7440-02-6	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	7440-39-0	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vanadium	7440-62-3	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	7440-66-6	NA	NA	NA	NA	NA	NA	NA	NA	NA

## Notes

CAS - Chemical Abstracts Service

HEAST - Health Effects Assessment Summary Tables, published annually by the USEPA (1987b).

IRIS - Integrated Risk Information System, an on-line computer database of toxicological information (USEPA, 2002b).

LOAEL - Lowest Observed Adverse Effects Level.

NCEA - National Center for Environmental Assessment

PRG - Preliminary Remediation Goal Table (10/2007) (USEPA, 2002b).

RfC - Reference Concentration

USEPA - United States Environmental Protection Agency.

(a) Converted from reference concentration: RfC (mg/m<sup>3</sup>) x (20 m<sup>3</sup> daily)/70kg.

(b) Trichloroethylene Health Risk Assessment Synthesis and Characterization EPA/600/p-01/003A August 2001 (USEPA, 2001a). Personal communication (USEPA, July 9, 2003).

(c) Value for 1,4-Dichlorobenzene

(d) Value for Heptachlor

(e) The CAS numbers for 3-Methylphenol and 4-Methylphenol are 108-44-6 and 105-39-4, respectively

(f) Value for Chloroform.

(g) Value for Chromium VI particulates.

TABLE 4-3  
DOSE-RESPONSE INFORMATION FOR CONSTITUENTS WITH POTENTIAL CARCINOGENIC EFFECTS BY THE ORAL ROUTE OF EXPOSURE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RIFS  
SAUGET, ILLINOIS

Constituent	CAS Number	EPA Carcinogen Class	Oral CSF (mg/kg-day) <sup>1</sup>	Oral CSF Reference (Last Verified)	Oral CSF Study Animal	Oral CSF Study Method
<b>VOCs</b>						
1,1,2-Trichloroethane	79-00-5	C	5.70E-02	IRIS (5/2003)	MOUSE	ORAL:GAVAGE
1,2-Dichloroethane	107-06-2	B2	9.10E-02	IRIS (5/2003)	RAT	ORAL:GAVAGE
1,2-Dichloroethane (total)	540-69-0	D	NA	(a) IRIS (5/2003)	NA	NA
2-Butanone (MEK)	78-93-3	D	NA	IRIS (5/2003)	NA	NA
4-Methyl-2-pentanone (MIBK)	108-10-1	NA	NA	IRIS (5/2003)	NA	NA
Acetone	67-64-1	D	NA	IRIS (5/2003)	NA	NA
Benzene	71-43-2	A	1.50E-02	(b) IRIS (5/2003)	HUMAN	INHALATION OCCUPATIONAL
Chlorobenzene	108-90-7	D	NA	IRIS (5/2003)	NA	NA
Chloroform	67-68-3	B2	NA	(c) IRIS (5/2003)	NA	NA
Chloromethane	74-87-3	C	1.30E-02	HEAST (1997)	MOUSE	INHALATION INTERMITTENT
Dichloromethane	75-08-2	B2	7.50E-03	IRIS (5/2003)	MOUSE	ORAL:DRINKING WATER
Ethylbenzene	100-41-4	D	NA	IRIS (5/2003)	NA	NA
Tetrachloroethane	127-18-4	NA	5.40E-01	(f) IRIS (5/2003)	MOUSE	ORAL:GAVAGE
Toluene	108-88-3	D	NA	IRIS (5/2003)	NA	NA
Trichloroethylene	79-01-6	NA	4.00E-01	(d) IRIS (5/2003)	HUMAN	ORAL:DRINKING WATER
Xylenes, Total	1330-20-7	NA	NA	NA	NA	NA
<b>SVOCs</b>						
1,2-Dichlorobenzene	95-50-1	D	NA	IRIS (5/2003)	NA	NA
1,3-Dichlorobenzene	541-73-1	D	NA	IRIS (5/2003)	NA	NA
1,4-Dichlorobenzene	106-46-7	C	2.40E-02	HEAST (1997)	MOUSE	ORAL:GAVAGE
2,4,6-Trichlorophenol	88-08-2	B2	1.10E-02	IRIS (5/2003)	RAT	ORAL:DIET
2,4-Dichlorophenol	120-83-2	NA	NA	NA	NA	NA
2,4-Dimethylphenol	105-67-9	NA	NA	NA	NA	NA
2-Chlorophenol	95-57-8	NA	NA	NA	NA	NA
2-Methylnaphthalene	91-57-8	NA	NA	NA	NA	NA
2-Nitroaniline	88-74-4	NA	NA	NA	NA	NA
3-Methylphenol/4-Methylphenol	(e)	C	NA	IRIS (5/2003)	NA	NA
4-Chloroaniline	106-47-8	NA	NA	NA	NA	NA
4-Nitroaniline	100-01-6	NA	2.10E-02	NCEA (11/1/02)	MOUSE	ORAL:GAVAGE
Benzo(a)anthracene	56-55-3	B2	7.30E-01	(f) IRIS (5/2003)	MOUSE/RAT	ORAL:DIET
Benzo(a)pyrene	50-32-8	B2	7.30E+00	IRIS (5/2003)	MOUSE/RAT	ORAL:DIET
Benzo(b)fluoranthene	206-96-2	B2	7.30E-01	(f) IRIS (5/2003)	MOUSE/RAT	ORAL:DIET
Benzo(g,h,i)perylene	191-24-2	D	NA	IRIS (5/2003)	NA	NA
Benzo(h)fluoranthene	207-08-9	B2	7.30E-02	(g) IRIS (5/2003)	MOUSE/RAT	ORAL:DIET
bis(2-Chloroethyl)ether	111-44-4	B2	1.10E+00	IRIS (5/2003)	MOUSE	ORAL:GAVAGE/DIET
bis(2-Ethylhexyl)phthalate	117-81-7	B2	1.40E-02	IRIS (5/2003)	MOUSE	ORAL:DIET
Dibenzo(a,h)anthracene	53-70-3	B2	7.30E+00	(h) IRIS (5/2003)	MOUSE/RAT	ORAL:DIET
Hexachlorobenzene	118-74-1	B2	1.80E+00	IRIS (5/2003)	RAT	ORAL:DIET
Indeno(1,2,3-cd)pyrene	193-39-5	B2	7.30E-01	(f) IRIS (5/2003)	MOUSE/RAT	ORAL:DIET
Naphthalene	91-20-3	C	NA	IRIS (5/2003)	NA	NA
Nitrobenzene	98-95-3	D	NA	IRIS (5/2003)	NA	NA
Phenol	108-95-2	D	NA	IRIS (5/2003)	NA	NA
<b>Pesticides</b>						
4,4'-DDE	72-55-9	B2	3.40E-01	IRIS (5/2003)	MOUSE/HAMSTER	ORAL:DIET
4,4'-DDT	50-29-3	B2	3.40E-01	IRIS (5/2003)	MOUSE/RAT	ORAL:DIET
Aldrin	308-00-2	B2	1.70E+01	IRIS (5/2003)	MOUSE	ORAL:DIET
alpha-BHC	319-84-6	B2	6.30E+00	IRIS (5/2003)	MOUSE	ORAL:DIET
alpha-Chlordane	5105-71-9	B2	3.50E-01	(i) IRIS (5/2003)	MOUSE	ORAL:DIET
beta-BHC	319-85-7	C	1.80E+00	IRIS (5/2003)	MOUSE	ORAL:DIET
delta-BHC	319-86-8	D	NA	IRIS (5/2003)	NA	NA
Dieldrin	60-57-1	B2	1.80E+01	IRIS (5/2003)	MOUSE	ORAL:DIET
Endrin Ketone	53494-70-5	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	58-99-9	B2-C	1.30E+00	HEAST (1997)	MOUSE	ORAL:DIET
Heptachlor	76-44-8	B2	4.50E+00	IRIS (5/2003)	MOUSE	ORAL:DIET
Heptachlor epoxide	1024-57-3	B2	8.10E+00	IRIS (5/2003)	MOUSE	ORAL:DIET
<b>Herbicides</b>						
2,4,5-T	93-78-5	NA	NA	NA	NA	NA
2,4-D	94-75-7	NA	NA	NA	NA	NA
MCPA	94-74-6	NA	NA	NA	NA	NA
MCPP	93-65-2	NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	B2	1.20E-01	IRIS (5/2003)	MOUSE	ORAL:DIET

**TABLE 4-3**  
**DOSE-RESPONSE INFORMATION FOR CONSTITUENTS WITH POTENTIAL CARCINOGENIC EFFECTS BY THE ORAL ROUTE OF EXPOSURE**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RWFS**  
**SAUGET, ILLINOIS**

Constituent	CAS Number	EPA Carcinogen Class	Oral CSF (mg/kg-day) <sup>-1</sup>	Oral CSF Reference (Last Verified)	Oral CSF Study Animal	Oral CSF Study Method
<b>PCBs</b>						
Total PCBs	1336-36-3	B2	2.00E+00 (j)	IRIS (5/2003)	RAT	ORAL-DIET
Dioxin						
2,3,7,8-TCDD-TEQ	1746-01-6	B2	1.50E+05	HEAST (1997)	RAT	ORAL-DIET
<b>Metals</b>						
Antimony	7440-36-0	NA	NA	NA	NA	NA
Arsenic	7440-36-2	A	1.50E+00	IRIS (5/2003)	HUMAN	ORAL-DRINKING WATER
Barium	7440-39-3	D	NA	IRIS (5/2003)	NA	NA
Beryllium	7440-41-7	B1	NA	IRIS (5/2003)	NA	NA
Cadmium	7440-43-8	B1	NA	IRIS (5/2003)	NA	NA
Chromium	7440-47-3	D	NA	IRIS (5/2003)	NA	NA
Cobalt	7440-48-4	B1	NA	NCEA (1/15/02)	NA	NA
Copper	7440-50-8	D	NA	IRIS (5/2003)	NA	NA
Lead	7439-92-1	B2	NA	NA	NA	NA
Manganese	7439-96-5	D	NA	IRIS (5/2003)	NA	NA
Mercury	7439-97-6	D	NA	IRIS (5/2003)	NA	NA
Nickel	7440-02-0	NA	NA (k)	NA	NA	NA
Thallium	7440-28-0	D	NA	IRIS (5/2003)	NA	NA
Vanadium	7440-82-2	NA	NA	NA	NA	NA
Zinc	7440-86-6	D	NA	IRIS (5/2003)	NA	NA

**Notes:**

CAS - Chemical Abstracts Service.

CSF - Cancer Slope Factor.

HEAST - Health Effects Assessment Summary Tables, published annually by the USEPA (1997b).

IRIS - Integrated Risk Information System, an online computer database of toxicological information (USEPA, 2003b).

NCEA - National Center for Environmental Assessment.

PRG - Preliminary Remediation Goal Table (10/2002) (USEPA, 2002b).

USEPA - United States Environmental Protection Agency.

(a) cis-1,2-Dichloroethene has a carcinogen class of D; trans-1,2-Dichloroethene has not been classified; per IRIS.

(b) IRIS provides a range of CSF for benzene of 1.5E-02 to 5.5E-02 kg<sup>-1</sup>day<sup>-1</sup>. IRIS states that each value within this range has equal scientific plausibility.

(c) The Oral RID can be considered protective of cancer according to IRIS (USEPA, 2003b).

(d) Trichloroethylene Health Risk Assessment synthesis and characterization. EPA/800/p-01/002A August 2001.

Personal communication (USEPA, July 9, 2003).

(e) The CAS numbers for 3-Methylphenol and 4-Methylphenol are 106-44-5 and 106-39-4, respectively.

(f) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 0.1 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993d).

(g) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 0.01 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993d).

(h) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 1.0 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993d).

(i) Value for Chloroethene.

(j) This is the upperbound CSF for high risk and persistence PCBs. USEPA provides a range of slope factor or IRIS; these will be discussed in the risk characterization.

(k) Information for nickel, soluble salts on IRIS.

(l) The NCEA has for the interim adopted the California EPA dose-response values for tetrachloroethylene. Personal communication (USEPA, July 9, 2003).

TABLE 4-4  
DOSE-RESPONSE INFORMATION FOR CONSTITUENTS WITH POTENTIAL CARCINOGENIC EFFECTS BY THE INHALATION ROUTE OF EXPOSURE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RWFS  
SAUGET, ILLINOIS

Constituent	CAS Number	EPA Carcinogen Class	Inhalation CSF (mg/kg-day) <sup>a</sup> (c)	Unit Risk Factor (1/ $\mu$ g/m <sup>3</sup> -yr)	Inhalation CSF Reference (Last Verified)	Inhalation CSF Study Animal	Inhalation CSF Study Method
<b>VOCs</b>							
1,1,2-Trichloroethane	79-00-6	C	5.00E-02	(b)	1.60E-06	IRIS (5/2003)	MOUSE ORAL: GAVAGE
1,2-Dichloroethane	107-06-2	B2	9.10E-02	(b)	2.60E-06	IRIS (5/2003)	RAT ORAL: GAVAGE
1,2-Dichloroethane (total)	540-58-0	D	NA	(c)	NA	IRIS (5/2003)	NA
2-Butanone (MEK)	78-93-3	D	NA	NA	IRIS (5/2003)	NA	NA
4-Methyl-2-pentanone (MIBK)	106-10-1	NA	NA	NA	IRIS (5/2003)	NA	NA
Acetone	67-64-1	D	NA	NA	IRIS (5/2003)	NA	NA
Benzene	71-43-2	A	7.70E-03	(b,d)	2.20E-06	IRIS (5/2003)	HUMAN INHALATION: OCCUPATIONAL
Chlorobenzene	106-90-7	D	NA	NA	IRIS (5/2003)	NA	NA
Chloroform	67-68-3	B2	8.06E-02	(b)	2.30E-06	IRIS (5/2003)	MOUSE ORAL: GAVAGE
Chloromethane	74-87-3	C	6.30E-03	NA	HEAST (1987)	MOUSE	INHALATION: INTERMITTENT
Dichloromethane	75-09-2	B2	1.66E-03	(b)	4.70E-07	IRIS (5/2003)	MOUSE INHALATION
Ethylbenzene	100-41-4	D	NA	NA	(e)	NA	NA
Tetrachloroethene	127-18-4	NA	2.10E-02	NA	(f)	MOUSE	INHALATION
Toluene	108-88-3	D	NA	NA	IRIS (5/2003)	NA	NA
Trichloroethylene	79-01-6	NA	4.00E-01	NA	(g)	HUMAN	ORAL: DRINKING WATER
Xylenes, Total	1330-20-7	NA	NA	NA	NA	NA	NA
<b>BVOCs</b>							
1,2-Dichlorobenzene	95-50-1	D	NA	NA	IRIS (5/2003)	NA	NA
1,3-Dichlorobenzene	541-73-1	D	NA	NA	IRIS (5/2003)	NA	NA
1,4-Dichlorobenzene	106-46-7	B2	2.20E-02	NA	NCEA (5/21/83)	MOUSE	ORAL: GAVAGE
2,4,6-Trichlorophenol	88-06-2	B2	1.08E-02	(b)	3.10E-06	IRIS (5/2003)	RAT ORAL: DIET
2,4-Dichlorophenol	120-83-2	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	106-67-9	NA	NA	NA	NA	NA	NA
2-Chlorophenol	95-57-4	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	91-57-8	C	NA	NA	NA	NA	NA
2-Nitroaniline	88-74-4	NA	NA	NA	NA	NA	NA
3-Methylphenol/4-Methylphenol	(f)	C	NA	NA	IRIS (5/2003)	NA	NA
4-Chloroaniline	106-47-8	NA	NA	NA	NA	NA	NA
4-Nitroaniline	100-01-6	NA	NA	NA	NA	NA	NA
Benzofuran	98-65-3	B2	3.10E-01	(m)	NA	NCEA (11/18/84)	HAMSTER INHALATION
Benzofuran	98-32-8	B2	3.10E+00	NA	8.80E-01	NCEA (11/18/84)	HAMSTER INHALATION
Benzofuran	205-98-2	B2	3.10E-01	(m)	NA	NCEA (11/18/84)	HAMSTER INHALATION
Benzofuran	191-24-2	D	NA	NA	NA	NA	NA
Benzofuran	207-08-9	B2	3.10E-02	(n)	NA	NCEA (11/18/84)	HAMSTER INHALATION
1,2-Dichloroethane	111-44-4	B2	1.10E+00	(b)	3.30E-04	IRIS (5/2003)	MOUSE ORAL: GAVAGE
1,2-Ethylbenzophenone	117-81-7	B2	NA	NA	IRIS (5/2003)	NA	NA
Benzofuran	83-70-3	B2	3.10E+00	(a)	NA	NCEA (11/18/84)	HAMSTER INHALATION
Hexachlorobenzene	118-74-1	B2	1.61E+00	(b)	4.60E-04	IRIS (5/2003)	RAT ORAL: DIET
Indane(1,2,3-cd)pyrene	183-38-5	B2	3.10E-01	(m)	NA	NCEA (11/18/84)	HAMSTER INHALATION
Naphthalene	91-20-3	C	NA	NA	IRIS (5/2003)	NA	NA
Nitrobenzene	98-96-3	D	NA	NA	IRIS (5/2003)	NA	NA
Phenol	108-95-2	D	NA	NA	IRIS (5/2003)	NA	NA
<b>Pesticides</b>							
4,4'-DDE	72-65-9	B2	NA	NA	IRIS (5/2003)	NA	NA
4,4'-DDT	50-29-3	B2	3.40E-01	(b)	9.70E-06	IRIS (5/2003)	MOUSE/RAT ORAL: DIET
Aldrin	300-00-2	B2	1.72E+01	(b)	4.80E-03	IRIS (5/2003)	MOUSE ORAL: DIET
alpha-BHC	319-84-6	B2	6.30E+00	(b)	1.80E-03	IRIS (5/2003)	MOUSE ORAL: DIET
alpha-Chlordane	5163-71-8	B2	3.80E-01	(b,j)	1.00E-04	IRIS (5/2003)	MOUSE ORAL: DIET
beta-BHC	319-85-7	C	1.80E+00	(b)	5.30E-04	IRIS (5/2003)	MOUSE ORAL: DIET
delta-BHC	319-86-8	D	NA	NA	IRIS (5/2003)	NA	NA
Dieldrin	60-57-1	B2	1.61E+01	(b)	4.60E-03	IRIS (5/2003)	MOUSE ORAL: DIET
Endrin Ketone	53494-70-5	NA	NA	NA	NA	NA	NA
gamma-BHC (Lindane)	56-48-6	B2-C	NA	NA	NA	NA	NA
Heptachlor	76-44-8	B2	4.66E+00	(b)	1.30E-03	IRIS (5/2003)	MOUSE ORAL: DIET
Heptachlor epoxide	1024-67-3	B2	9.10E+00	(b)	2.60E-03	IRIS (5/2003)	MOUSE ORAL: DIET
<b>Herbicides</b>							
2,4,5-T	93-78-5	NA	NA	NA	NA	NA	NA
2,4-D	94-75-7	NA	NA	NA	NA	NA	NA
MCPA	94-74-6	NA	NA	NA	NA	NA	NA
MCPP	93-65-2	NA	NA	NA	NA	NA	NA
Pentachlorophenol	87-86-5	B2	NA	NA	IRIS (5/2003)	NA	NA

**TABLE 4-4**  
**DOSE-RESPONSE INFORMATION FOR CONSTITUENTS WITH POTENTIAL CARCINOGENIC EFFECTS BY THE INHALATION ROUTE OF EXPOSURE**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RIFS**  
**SAUGET, ILLINOIS**

Constituent	CAS Number	EPA Carcinogen Class	Inhalation CSF (human-dose) <sup>a</sup> (m <sup>3</sup> /kg)	Unit Risk Factor (m <sup>3</sup> /kg)	Inhalation CSF Reference (Last Verified)	Inhalation CSF Study Animal	Inhalation CSF Study Method
PCBs							
Total PCBs	1336-36-3	B2	2.00E+00 (b,k)	NA	IRIS (5/2003)	RAT	ORAL-DIET
Dioxin							
2,3,7,8-TCDD-TEQ	1746-01-6	B2	1.50E+05	3.30E+01	HEAST (1997)	RAT	ORAL-DIET
Metals							
Antimony	7440-36-0	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	A	1.51E+01 (b)	4.30E-03	IRIS (5/2003)	HUMAN	INHALATION-OCCUPATIONAL
Barium	7440-39-3	D	NA	NA	IRIS (5/2003)	NA	NA
Beryllium	7440-41-7	B1	8.40E+00 (b)	2.40E-03	IRIS (5/2003)	HUMAN	INHALATION-OCCUPATIONAL
Cadmium	7440-43-9	B1	6.30E+00 (b)	1.80E-03	IRIS (5/2003)	HUMAN	INHALATION-OCCUPATIONAL
Chromium	7440-47-3	A	4.20E+01 (b)	1.20E-02	IRIS (5/2003)	HUMAN	INHALATION-OCCUPATIONAL
Cobalt	7440-48-4	B1	9.80E+00 (b)	2.80E-03	NCEA (1/15/02)	MOUSE	INHALATION
Copper	7440-50-8	D	NA	NA	IRIS (5/2003)	NA	NA
Lead	7439-92-1	B2	NA	NA	NA	NA	NA
Manganese	7439-96-5	D	NA	NA	IRIS (5/2003)	NA	NA
Mercury	7439-97-8	D	NA	NA	IRIS (5/2003)	NA	NA
Nickel	7440-02-0	NA	NA (f)	NA	NA	NA	NA
Thallium	7440-28-0	NA	NA	NA	NA	NA	NA
Vanadium	7440-62-2	NA	NA	NA	NA	NA	NA
Zinc	7440-68-6	D	NA	NA	IRIS (5/2003)	NA	NA

## Notes:

CAS - Chemical Abstracts Service.

CSF - Cancer Slope Factor.

HEAST - Health Effects Assessment Summary Tables, published annually by the USEPA (1997b).

IRIS - Integrated Risk Information System, an online computer database of toxicological information (USEPA, 2003b).

NCEA - National Center for Environmental Assessment.

PRG - Preliminary Remediation Goal Table (10/2002) (USEPA, 2002b).

RBC - Risk Based Concentration Table (4/2003) (USEPA, 2003e).

USEPA - United States Environmental Protection Agency.

(a) Inhalation CSF calculated from the unit risk factor, where available, assuming a 70 kg adult breathes 20 m<sup>3</sup> of air per day.(b) Converted from inhalation unit risk: URF m<sup>3</sup>/ug x (70g x (1day/20m<sup>3</sup>) x 1000 ug/mg).

(c) cis-1,2-Dichloroethene has a carcinogen class of D; trans-1,2-Dichloroethene has not been classified; per IRIS.

(d) IRIS provides a range of inhalation unit risk factors for benzene of 2.2E-06 to 7.9E-06 m<sup>3</sup>/ug. These are equivalent to an CSF range of 7.7 E-03 to 2.7E-02 kg/day/mg. IRIS states that each value within this range has equal scientific plausibility.

(e) The NCEA has withdrawn the provisional unit risk factor (personal communication, USEPA July 9, 2003).

(f) The NCEA has for the interim adopted the California EPA dose-response values for tetrachloroethylene. Personal communication (USEPA, July 9, 2003).

(g) Trichloroethylene Health Risk Assessment Synthesis and Characterization. EPA/600/p-01/002A August 2001. Personal communication (USEPA, July 9, 2003).

(h) Based on information for naphthalene.

(i) The CAS numbers for 3-Methylphenol and 4-Methylphenol are 108-44-5 and 108-38-4, respectively.

(j) Value for Chloroethene.

(k) This is the upperbound CSF for PCBs for dust/resol inhalation. USEPA provides a range of slope factors on IRIS; these will be discussed in the risk characterization.

(l) Information for Nickel, soluble salts, on IRIS.

(m) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 0.1 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993d).

(n) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 0.01 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993d).

(o) CSF based on that for benzo(a)pyrene and applying a relative potency factor of 1.0 per USEPA Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (USEPA, 1993d).

**TABLE 4-5**  
**TIERS OF CANCER SLOPE FACTORS FOR ENVIRONMENTAL PCBs (a)**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RIFS**  
**SAUGET, ILLINOIS**

<b>HIGH RISK AND PERSISTENCE</b>
Upper-bound slope factor: 2.0 per (mg/kg)/day Central-estimate slope factor: 1.0 per (mg/kg)/day
Criteria for use: <ul style="list-style-type: none"> <li>- Food chain exposure</li> <li>- Sediment or soil ingestion</li> <li>- Dust or aerosol inhalation</li> <li>- Dermal exposure, if an absorption factor has been applied</li> <li>- Presence of dioxin-like, tumor-promoting, or persistent congeners</li> <li>- Early-life exposure (all pathways and mixtures)</li> </ul>
<b>LOW RISK AND PERSISTENCE</b>
Upper-bound slope factor: 0.4 (mg/kg-day) <sup>-1</sup> Central-estimate slope factor: 0.3 (mg/kg-day) <sup>-1</sup>
Criteria for use: <ul style="list-style-type: none"> <li>- Ingestion of water-soluble congeners</li> <li>- Inhalation of evaporated congeners</li> <li>- Dermal exposure if no absorption factor has been applied</li> </ul>
<b>LOWEST RISK AND PERSISTENCE</b>
Upper-bound slope factor: 0.07 (mg/kg-day) <sup>-1</sup> Central-estimate slope factor: 0.04 (mg/kg-day) <sup>-1</sup>
Criteria for use: Congener or isomer analyses verify that congeners with more than 4 chlorines comprise less than 0.5% of total PCBs.
Notes: (a) - USEPA. 2003b. Integrated Risk Information System (IRIS).

**TABLE 4-6**  
**TEFs FOR DIOXIN AND FURAN CONGENERS**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, ILLINOIS**

Constituent	CAS NO.	TEF (a)
<b>Dioxins</b>		
2,3,7,8-TetraCDD	1746-01-6	1
1,2,3,7,8-PentaCDD	40321-76-4	1
1,2,3,4,7,8-HexaCDD	39227-28-6	0.1
1,2,3,6,7,8-HexaCDD	57853-85-7	0.1
1,2,3,7,8,9-HexaCDD	19408-74-3	0.1
1,2,3,4,6,7,8-HeptaCDD	35822-39-4	0.01
OctaCDD	3268-87-9	0.0001
2,3,7,8-PentaCDDs	NA	NA
2,3,7,8-HexaCDDs	NA	NA
2,3,7,8-HeptaCDDs	NA	NA
<b>Furans</b>		
2,3,7,8-TetraCDF	51207-31-9	0.1
1,2,3,7,8-PentaCDF	57117-41-6	0.05
2,3,4,7,8-PentaCDF	57117-31-4	0.5
1,2,3,4,7,8-HexaCDF	70648-26-9	0.1
1,2,3,6,7,8-HexaCDF	57117-44-9	0.1
1,2,3,7,8,9-HexaCDF	72918-21-9	0.1
2,3,4,6,7,8-HexaCDF	60851-34-5	0.1
1,2,3,4,6,7,8-HeptaCDF	67562-39-4	0.01
1,2,3,4,7,8,9-HeptaCDF	55673-89-7	0.01
OctaCDF	39001-02-0	0.0001
2,3,7,8-HexaCDFs	NA	NA
2,3,7,8-HeptaCDFs	NA	NA
<b>Notes:</b> CAS - Chemical Abstracts Service. CDD- Chlorodibenzodioxin CDF - Chlorodibenzofuran. TEF - Toxicity Equivalency Factor. (a) - "Toxic Equivalency Factors for PCBs, PCDDs, PCDFs for Humans and Wildlife." Van den Berg, et al. 1998.		



## 5.0 EXPOSURE ASSESSMENT

The purpose of the exposure assessment is to predict the magnitude and frequency of potential human exposure to each of the COPC retained for quantitative evaluation in the HHRA. The first step in the exposure assessment process is the characterization of the setting of the site and surrounding area. Current and potential future site uses and potential receptors (i.e., people who may contact the impacted environmental media of interest) are then identified. Potential exposure scenarios identifying appropriate environmental media and exposure pathways for current and potential future site uses and receptors are then developed. Those potential exposure pathways for which COPCs are identified and are judged to be complete are evaluated quantitatively in the risk assessment. This information is used to develop or update the CSM for the site.

To estimate the potential risk to human health that may be posed by the presence of COPCs in environmental media in the study area, it is first necessary to estimate the potential exposure dose of each COPC for each receptor. The exposure dose is estimated for each constituent via each exposure route/pathway by which the receptor is assumed to be exposed. Reasonable maximum exposure (RME) scenarios, and most likely exposure (MLE) scenarios based on appropriate USEPA guidance are both evaluated in the quantitative risk assessment. Exposure dose equations combine the estimates of constituent concentration in the environmental medium of interest with assumptions regarding the type and magnitude of each receptor's potential exposure to provide a numerical estimate of the exposure dose. The exposure dose is defined as the amount of COPC taken into the receptor and is expressed in units of milligrams of COPC per kilogram of body weight per day (mg/kg-day). The exposure doses are combined with the toxicity values to estimate potential risks and hazards for each receptor.

This section contains five subsections. Section 5.1 presents the updated CSM for the site and identifies the potential exposure scenarios and receptors. Section 5.2 presents methods for quantifying potential exposures. Section 5.3 presents the receptor-specific exposure parameters. Section 5.4 identifies exposure point concentrations (EPCs). Section 5.5 presents the constituent-specific exposure parameters.

### 5.1 Conceptual Site Model

To guide identification of appropriate exposure pathways and receptors for evaluation in the risk assessment, a CSM for human health was developed as part of the scoping activities in the HHRA Workplan (presented in Appendix A). The purpose of the CSM is to identify source areas, potential migration pathways of constituents from source areas to environmental media where exposure can occur, and to identify potential human receptors. The CSM is meant to be a "living" model that can be updated and modified as additional data become available.

The initial CSM for the site is presented in Figure 11-2 of Appendix A. Table 11-2 of Appendix A presented the matrix of receptors and pathways by area and medium that would be considered for evaluation in the risk assessment. The CSM and the receptor area matrix have not changed based on a review of the analytical results and the COPC selection process. The CSM is presented in Figure 5-1. The receptor/area matrix is presented in Table 5-1. Both are discussed below.

### **5.1.1 Identification of Media for Exposure Evaluation**

#### **5.1.1.1 Sites**

In Sauget Area 2, the sites are identified as Sites O, P, Q, R, and S. These are identified as source areas in the CSM (Figure 5-1). Constituents in the Sites may leach to underlying groundwater. In accordance with the SSP, samples of wastes in the sites were analyzed by TCLP to address the potential leaching to groundwater pathway.

COPCs were identified in samples of shallow groundwater in Site O, and in leachate in Sites O, Q, and R (Table 3-3). COPCs were identified in samples of mid-groundwater in Sites Q and R (Table 3-4). Groundwater, therefore, is identified as a secondary source in the CSM (Figure 5-1), and these COPCs are quantitatively evaluated in the HHRA.

VOCs identified as COPCs in shallow/mid groundwater and in leachate may volatilize and infiltrate into indoor air in overlying buildings and into outdoor air, and these potential exposure pathways (Figure 5-1) are evaluated in the HHRA. Construction work may occur to depths at which shallow groundwater may be encountered by direct contact, and this pathway is evaluated in the HHRA. It is assumed that construction could occur to depths up to 15 feet bgs. It is assumed that volatilization of VOCs to indoor or outdoor air can occur from groundwater up to 30 feet bgs, although this pathway is more commonly evaluated for groundwater less than 15 feet bgs (MADEP, 1995).

No COPCs were identified in surface soil in Site R, therefore, this medium is not further evaluated in the HHRA. COPCs were identified in surface soil for the remaining Sites. COPCs in surface soil may be suspended in dusts in outdoor air.

COPCs in combined soil (surface soil, subsurface soil, and waste) were identified in all Sites (Table 3-2). Volatile COPCs in combined soils may volatilize to ambient air. Non-volatile COPCs in combined soils may become suspended in excavation dusts.

Exposures to COPCs in outdoor air and indoor air as well as direct contact with soils are evaluated as potential exposure pathways in the HHRA (Figure 5-1).

COPCs were identified in Site Q Pond surface water (Table 3-6), as well as in fish fillet samples collected from the Site Q Pond (Table 3-7).

#### **5.1.1.2 Mississippi River**

Surface water and sediment samples in the Mississippi River were collected and analyzed and evaluated as one area in the HHRA. COPCs were identified in surface water (Table 3-6) and sediment (Table 3-7). COPCs were also identified in fish fillet samples (Table 3-7).

### **5.1.2 Identification of Receptors and Potential Exposure Scenarios**

Exposure scenarios are developed on the basis of the CSM for a site. A general identification of exposure pathways, exposure routes, and receptors is provided in the CSM (Figure 5-1). A more detailed summary is provided in Table 5-1, the receptor/area matrix.

#### **5.1.2.1 Sites**

Sauget Area 2 sites have been used for industrial purposes for many years (since the 1930s or earlier) and use of these areas is expected to remain industrial. The sites within Sauget Area 2 are zoned commercial/industrial and it is likely that the sites will continue to be used well into the reasonably foreseeable future for commercial/industrial purposes. Therefore, the sites were evaluated for non-residential use scenarios.

Receptors were identified for the sites based on the CSM (Figure 5-1 and Table 5-1) and the COPCs identified in media in the Sites. COPCs were identified in groundwater in Sites O and R, in leachate in Sites O, Q, and R, and in soils in all Sites, except for surface soil in Site R. COPCs were identified in surface water and fish fillet in the Site Q Pond.

An on-site outdoor industrial worker and a trespassing teen are evaluated for potential exposure to COPCs in surface soil via incidental ingestion and dermal contact, and via inhalation of non-volatile COPCs that may be suspended as dusts from surface soils. Additionally, these receptors are evaluated for potential exposure to COPCs that may volatilize into outdoor air from underlying groundwater and from soils (combined surface soil, subsurface soil, and waste).

An on-site construction/utility worker is evaluated for potential exposure to COPCs in combined soils via incidental ingestion and dermal contact, and via inhalation of particulates suspended during excavation activity as well as volatile emissions. Construction/utility work is assumed to occur up to depths of 15 feet bgs as noted above. Due to the shallow depth of groundwater in limited areas, the construction/utility worker may contact groundwater during excavation. Therefore, the construction worker is assumed to be exposed to COPCs in shallow groundwater via incidental ingestion and

dermal contact, and via inhalation of COPCs volatilized from standing water in an excavation trench. COPCs in shallow groundwater and leachate were identified in Sites O, Q, and R.

Due to the presence of VOCs in groundwater and leachate in Sites O, Q, and R, an on-site indoor industrial worker will be evaluated for potential exposure to COPCs via inhalation of volatile constituents present in indoor air due to vapor intrusion from groundwater/leachate. It is unlikely that the indoor worker receptor would be exposed to soils to the same extent as an outdoor worker, therefore, this pathway was concluded to be insignificant and was not quantitatively evaluated in the risk assessment for the indoor worker.

A recreational fisher and a trespassing teenager are evaluated for potential exposure to COPCs in surface water and fish fillet from the Site Q Pond (note, no COPCs were identified in Site Q Pond sediment).

#### **5.1.2.2 Mississippi River**

A recreational fisher and a trespassing teenager are evaluated for potential exposure to COPCs in sediment, surface water, and fish fillet from the Mississippi River.

### **5.2 Quantification of Potential Exposures**

To estimate the potential risk to human health that may be posed by the presence of COPCs at the site, it is first necessary to estimate the potential exposure dose of each COPC. The exposure dose is estimated for each constituent via each exposure pathway by which the receptor is assumed to be exposed. Exposure dose equations combine the estimates of constituent concentration in the environmental medium of interest with assumptions regarding the type and magnitude of each receptor's potential exposure to provide a numerical estimate of the exposure dose. The exposure dose is defined as the amount of COPC taken into the receptor and is expressed in units of milligrams of COPC per kilogram of body weight per day (mg/kg-day).

Exposure doses are defined differently for potential carcinogenic and noncarcinogenic effects. The Chronic Average Daily Dose (CADD) is used to estimate a receptor's potential intake from exposure to a COPC with noncarcinogenic effects. According to USEPA (1989a), the CADD should be calculated by averaging the dose over the period of time for which the receptor is assumed to be exposed. Therefore, the averaging period is the same as the exposure duration. For COPCs with potential carcinogenic effects, however, the Lifetime Average Daily Dose (LADD) is employed to estimate potential exposures. In accordance with USEPA (1989a) guidance, the LADD is calculated by averaging exposure over the receptor's assumed lifetime (70 years). Therefore, the averaging period is the same as the receptor's assumed lifetime. The standardized equations for estimating a receptor's

average daily dose (both lifetime and chronic) are presented below, followed by descriptions of receptor-specific exposure parameters (Section 5.3) and constituent-specific parameters (Section 5.5).

### 5.2.1 Estimating Potential Exposure from Ingestion of and Dermal Contact with Soil or Sediment

Average Daily Dose (Lifetime and Chronic) Following Incidental Ingestion of Soil or Sediment (mg/kg-day):

$$ADD = \frac{CS \times IR \times EF \times ED \times AAF_o \times CF}{BW \times AT}$$

where:

ADD	=	Average daily dose (mg/kg-day)
CS	=	Soil concentration (mg/kg soil)
IR	=	Ingestion rate (mg soil/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (year)
AAF <sub>o</sub>	=	Oral-soil absorption adjustment factor (AAF) (unitless)
CF	=	Unit conversion factor (kg soil/10 <sup>6</sup> mg soil)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

Average Daily Dose (Lifetime and Chronic) Following Dermal Contact with Soil or Sediment (mg/kg-day):

$$ADD = \frac{CS \times SA \times AF \times EF \times ED \times AAF_d \times CF}{BW \times AT}$$

where:

ADD	=	Average daily dose (mg/kg-day)
CS	=	Soil concentration (mg/kg soil)
SA	=	Exposed skin surface area (cm <sup>2</sup> /day)
AF	=	Soil to skin adherence factor (mg soil/cm <sup>2</sup> )

EF	=	Exposure frequency (days)
ED	=	Exposure duration (year)
AAF <sub>d</sub>	=	Dermal-soil AAF (unitless)
CF	=	Unit conversion factor (kg soil/10 <sup>6</sup> mg soil)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

### 5.2.2 Estimating Potential Exposure via Inhalation

Average Daily Dose (Lifetime and Chronic) Following Inhalation of COPC (mg/kg-day):

$$ADD = \frac{CA \times IR \times AAF_i \times ET \times EF \times ED}{BW \times AT}$$

where:

ADD	=	Average daily dose (mg/kg-day)
CA	=	Air concentration (mg/m <sup>3</sup> )
IR	=	Inhalation rate (m <sup>3</sup> /hr)
AAF <sub>i</sub>	=	Inhalation AAF (unitless)
ET	=	Exposure time (hours/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (year)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

### 5.2.3 Estimating Potential Exposure from Groundwater/Surface Water

Average Daily Dose (Lifetime and Chronic) Following Ingestion of Water (mg/kg-day):

$$ADD = \frac{CW \times IR \times EF \times ED \times AAF_o \times CF}{BW \times AT}$$

where:

ADD	=	Average daily dose (mg/kg-day)
CW	=	Water concentration (mg/L)

IR	=	Water ingestion rate (L/day)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (year)
AAF <sub>o</sub>	=	Oral-water AAF (unitless)
BW	=	Body weight (kg)
AT	=	Averaging time (days)

Average Daily Dose (Lifetime and Chronic) Following Dermal Contact with Water  
(mg/kg-day):

$$ADD = \frac{CW \times SA \times PC \times ET \times EF \times ED \times AAF_d \times CF}{BW \times AT}$$

where:

ADD	=	Average daily dose (mg/kg-day)
CW	=	Water concentration (mg/L)
SA	=	Exposed skin surface area (cm <sup>2</sup> )
PC	=	Dermal permeability constant (cm/hr)
ET	=	Exposure time (hours/day)
EF	=	Days exposed per year (day/year)
ED	=	Years exposed (year)
AAF <sub>d</sub>	=	Dermal-water AAF (unitless)
CF	=	Unit conversion factor (L/10 <sup>3</sup> cm <sup>3</sup> )
BW	=	Body weight (kg)
AT	=	Averaging time (year)

#### 5.2.4 Estimating Potential Exposure From Fish Consumption

Average Daily Dose (Lifetime and Chronic) Following Fish Consumption (mg/kg-day):

$$ADD = \frac{CF \times IR \times AAF \times EF \times ED}{AT \times BW}$$

where:

ADD	=	Average daily dose (mg/kg-day)
-----	---	--------------------------------

CF	=	Concentration in fish fillet (mg/kg)
IR	=	Ingestion rate (kg/day)
AAF	=	Oral-diet AAF (unitless)
EF	=	Exposure frequency (days/year)
ED	=	Exposure duration (years)
AT	=	Averaging time (days)
BW	=	Body weight (kg)

Appendix M presents the exposure dose and risk calculation spreadsheets. The risk results are discussed in Section 6.0.

### 5.3 Receptor-Specific Exposure Parameters

The following subsections present the parameters that were used to evaluate each of the potential receptors in the HHRA. Both RME and MLE scenarios were evaluated for each receptor. Receptor-specific exposure parameters are presented in Section 5.3.1. Exposure factors common to several of the receptors are discussed in Section 5.3.2 and 5.3.3. Both the receptor-specific and the common exposure parameters were presented in the HHRA Workplan (Appendix A).

#### 5.3.1 Receptor-Specific Exposure Parameters

Exposure assumptions for the indoor industrial worker under the RME and MLE scenarios are shown in Table 5-2.

Exposure assumptions for the outdoor industrial worker under the RME and MLE scenarios are shown in Table 5-3.

Exposure assumptions for the trespassing teenager under the RME and MLE scenarios are shown in Table 5-4.

Exposure assumptions for the construction/utility worker under the RME and MLE scenarios are shown in Table 5-5.

The exposure assumptions for the recreational adult fish ingestion pathway for the RME and MLE receptors are summarized in Table 5-6.

Soil adherence factors for the outdoor industrial worker, the construction worker, and the trespassing teenager are calculated in Table 5-7.

### 5.3.2 Soil Ingestion Rate – Adult Construction Worker

Incidental soil ingestion occurs at all ages as a result of hand-to-mouth activities. Currently, there are little or no reliable quantitative data available for estimating adult soil ingestion rates. USEPA risk assessment guidance suggests a soil ingestion rate of 100 mg/day for adults in a residential scenario (USEPA, 1989a, 1991b), and a soil ingestion rate of 50 mg/day for adults in an industrial scenario (USEPA, 1991b).

USEPA presented an estimate of a soil ingestion rate for adults doing yard work of 480 mg/day in their supporting evidence for the commercial/industrial soil ingestion rate of 50 mg/day in the "Standard Default Exposure Factors" Directive (USEPA, 1991b); the 480 mg/day value was not presented in the table of default exposure factors. The Agency states: "For certain outdoor activities in the commercial/industrial setting (e.g., construction or landscaping), a soil ingestion rate of 480 mg/day may be used; however, this type of work is usually short-term and is often dictated by the weather. Thus, exposure frequency would generally be less than one year and exposure duration would vary according to site-specific construction/maintenance plans." However, some regions and state agencies have stipulated the use of this value to evaluate a construction worker exposure scenario. The Hawley (1985) study, which is the basis for the soil ingestion rate of 480 mg/day, was recently reviewed by the USEPA (USEPA, 1997a), which stated that, "Given the lack of supporting measurements, these estimates must be considered conjectural."

In the Hawley (1985) study, the author assumed that soil adheres to the surface area of the hands at a loading of 3.5 mg/cm<sup>2</sup>. This value was based on a layer of soil on skin assumed to be 0.005 cm deep, a soil density of 1.5 g/cm<sup>3</sup>, and 50% void space. Using the author's derived soil-to-skin adherence loading of 3.5 mg/cm<sup>2</sup> and assuming that the amount of soil covering a fraction of the hands (approximately 70 cm<sup>2</sup>) is ingested twice a day, Hawley calculated a soil ingestion rate of 480 mg/day.

Hawley's 1985 analysis was one of the first published health risk assessments and was performed before any of the quantitative fecal tracer soil ingestion studies for either children or adults were conducted (Calabrese et al., 1989; Davis et al., 1990; Clausen et al., 1987; Calabrese et al., 1990). Thus, the estimate of 480 mg/day predates all of our current knowledge about soil ingestion among both children and adults, as well as recent published data on soil-to-skin adherence rates.

In 1993, USEPA sponsored a workshop to evaluate soil-to-skin adherence data. As a result, a study to determine a more accurate characterization of soil-to-skin adherence was sponsored by the USEPA and conducted by John C. Kissel and associates at the University of Washington (Kissel et al., 1996; Holmes et al., 1998). The intent of this study was to resolve uncertainties and develop more accurate measures of soil-to-skin loading rates for individuals involved in various occupational and recreational activities. As reported in the Exposure Factors Handbook (EFH) (USEPA, 1997a), soil loading on skin surfaces as a result of various occupational and recreational activities was directly measured. This

study indicates that soil loadings vary with the type of activity and the body parts contacted. As one would expect, adherence appears to be greatest during outdoor activities such as farming and gardening, and more soil/dust tends to adhere to the hands and knees than to other areas of the body.

Average hand soil loading factors are presented in the EFH (USEPA, 1997a) for the adult outdoor workers evaluated by Kissel and Holmes. In every case, soil adherence during occupational exposure was measured to be considerably lower than Hawley's estimate of 3.5 mg/cm<sup>2</sup>. The range of soil adherence loadings measured by Kissel and Holmes falls within the USEPA range of 0.2 to 1.0 mg/cm<sup>2</sup> (USEPA, 1992b).

For this evaluation, the construction worker receptor is assumed to be exposed to COPCs in surface and subsurface soils during excavation activity. Based on this exposure scenario, the "farmer" receptor provided in the EFH is considered to provide an upper-bound estimate of soil adherence. A soil ingestion rate can be calculated by substituting the soil adherence value for the receptor for the estimated value derived by Hawley (1985), as follows:

$$\frac{480 \text{ mg/day}}{3.5 \text{ mg/cm}^2} = \frac{\text{ingestion rate (mg/day)}}{\text{soil adherence (mg/cm}^2\text{)}}$$

The soil adherence value for the "farmer" is 0.47 mg/cm<sup>2</sup>. The calculated soil ingestion value is 64 mg/day.

Additional support for this value comes from an additional paper by Kissel and coworkers (Kissel et al., 1998) that presents the results of a study of the transfer of soil from hand to mouth by intentional licking. Soil was loaded onto the skin by pressing the hand onto soil, and the amount transferred to the mouth was measured. The thumb sucking, finger mouthing, and palm licking activities resulted in geometric mean soil mass transfers of 7.4 to 16 mg per event. The author concludes that "transfer of 10 mg or more of soil from a hand to the oral cavity in one event is possible, but requires moderate soil loading and more than incidental hand-to-mouth contact." However, "the fraction of soil transferred from hand to mouth that is subsequently swallowed is unknown but may be less than 100 percent." In addition, "the adult volunteers in this study reported that the presence of roughly 10 mg of soil in the mouth is readily detected (and unpleasant). Repeated unintentional ingestion of that mass of soil by adults therefore seems unlikely. In light of this observation, the 480 mg per day estimate [of Hawley, 1985] would require hundreds or perhaps thousands of hand-to-mouth contacts that resulted in soil transfer per day."

For the RME scenario, a soil ingestion rate of 100 mg/day is assumed for the construction worker. This is the adult soil ingestion rate provided by USEPA (1991b). For the MLE scenario, the soil ingestion rate of 64 mg/kg derived above was used.

### 5.3.3 Frequency of Exposure to COPC in Soil

A meteorological factor is generally used to account for the fraction of the year during which exposure to constituents in soils may occur (Sheehan et al., 1991; USEPA, 1989a). It is reasonable to assume that direct contact with soil or intrusive activities will not occur for non-excavation receptors (i.e., outdoor industrial worker, trespassing teenager) during inclement weather, i.e., when it is raining or snowing, when the ground is wet or frozen, or when snow or ice (32 degrees F) are covering the ground. This is not to say that workers or trespassers would not be outdoors on such days, only that the soil would not be available for significant contact either because it is wet or frozen. Thus the frequency of contact with potentially impacted soil is adjusted for these site-specific meteorological conditions (USEPA, 1989a).

There are only a few metrics that can be used to describe the fraction of the year when meteorological conditions are likely to limit exposure. These include temperature and the amount of precipitation per day and per year, which includes rain, snow and ice. While measures are collected hourly, the National Weather Service (NWS, 1986-1995) reports the number of days when precipitation is greater than 0.01 inches (one one-hundredth), greater than 0.1 inches (one tenth), and greater than 1 inch in their annual summary data. The number of days with precipitation greater than 0.1 inches is selected as the best representation of when exposure is likely to be limited by snow, rain, or ice. The National Oceanographic and Atmospheric Administration (NOAA) provides daily temperature data. It is assumed that exposure to soils is limited by temperatures less than 32 degrees F. Therefore, evaluating exposure to soils to those days with less than 0.1 inch of precipitation and temperatures above 32 degrees F is reasonable.

Based on ten years of meteorological data (1986-1995) provided by NOAA (1996), a meteorological factor is derived for use in the exposure equations. On the average, 66 days/year in this area receive 0.1 or greater inches of precipitation, and there are typically 27 days/year with a mean temperature of 32 degrees F or below. Accounting for days when both events occur (assumed to be 10% of the rain days or 6 days/year), the number of inclement days, 87, can be calculated ( $27 + 66 - 6 = 87$ ). It is assumed that these days are evenly spaced throughout the course of the year. The meteorological factor is then calculated ( $87/365 = 24\%$ ). Thus it is assumed that exposure to soils will not occur for the "receptor" 24% of the assumed days of exposure (exposure frequency) due to weather restrictions.

The choice of a precipitation target of 0.1 inches is in keeping with guidance provided in the Compilation of Air Pollution Emission Factors, which assumes that soil suspension will not occur on days with more than 0.01 inches of precipitation (USEPA, 1995b). It is probable, however, that this

metric both over- and under-estimates the potential exposure in some conditions. For, example, it is possible that some exposure to soils may occur on days when it rains just over 0.1 inches in the early morning and then the ground dries during the course of the day. Alternatively, significant rainfall, such as greater than 1 inch, is likely to saturate the soil for consecutive days, and several inches of snow (which may fall all on one day with one storm) may cover the ground and inhibit direct contact for several days. With both of these considerations in mind, it is likely that a meteorological factor based on inclement days defined as precipitation greater than 0.1 inches and average temperatures less than 32 degrees F is reasonable.

## **5.4 Exposure Point Concentrations**

Exposure points are located where potential receptors may contact COPCs at or from the site. The concentration of COPCs in the environmental medium that receptors may contact must be estimated in order to determine the magnitude of potential exposure. The estimation of EPCs in media evaluated for the HHRA is discussed below.

### **5.4.1 Measured EPCs**

The EPC for a human health risk assessment is defined as the 95% upper confidence limit (UCL) on the arithmetic mean concentration, or the maximum concentration, whichever is lower (USEPA, 2002a), for the RME scenario and the arithmetic mean concentration for the MLE scenario.

Summary statistics have been calculated for each constituent in each medium, as presented in Appendix B. As discussed in Section 3.0, before summary statistics were calculated, the following steps were taken for each constituent. If a constituent was detected in at least once in an area/medium combination, one-half the constituent's quantitation limit was used as a proxy concentration in the estimation of exposure point concentrations for those instances in which the constituent was reported as not detected. However, if the proxy concentration is greater than any detected value in that area/medium, the proxy concentration was removed from the calculation. This is consistent with USEPA guidance (USEPA, 1989a) which recognizes that high sample quantitation limits can lead to unrealistic concentration estimates. Duplicate sample analytical results were averaged, and the average used as the sample point concentration (USEPA, 1989c).

For COPCs, 95% UCLs were calculated. USEPA (2002a) provides guidance on the methodology for calculating 95% UCLs. The calculation of the 95% UCL is dependent on the data distribution, which can be normal, lognormal, or nonparametric. For normally distributed datasets, the guidance recommends the use of the Student's t-statistic to calculate a 95% UCL. However, for lognormal or nonparametric datasets, a variety of methods are used, depending on the skewness and other characteristics of the data. Therefore, an ENSR-developed program has been used to implement the recommendations of the guidance. This program is described in Appendix I. The USEPA program

ProUCL, which has been developed to partially implement the guidance (USEPA, 2002a), does not always make a final selection as to which 95% UCL is appropriate. The ENSR program results were compared with the ProUCL results for several COPCs, and the 95% UCLs were similar. The input and output files for the calculation of each 95% UCL are presented in Appendix I. Note that the input file is simply a list of numbers that represent the sample concentrations for the COPC in question after non-detects were handled as discussed above and duplicates were averaged. The final table of the appendix presents the EPC selection procedure. For COPCs in areas/media with fewer than eight samples, the maximum detected concentration is selected as the EPC. For all other COPCs, the lower of the calculated 95% UCL and the maximum detect is selected as the EPC.

The EPCs for each medium and scenario are presented in Tables 5-8 through 5-18 for the RME and MLE scenarios.

#### **5.4.2 Modeled EPCs**

Some pathways required modeling to derive the EPCs. These pathways include volatile constituents in groundwater migrating upwards and infiltrating into indoor air, outdoor air and excavation air, and generation of fugitive dusts from undisturbed soils as well as during construction activities.

The model used to predict indoor air concentrations of VOCs for evaluation of the indoor worker receptor was the model of Johnson and Ettinger recommended by the USEPA (2003c) to predict concentrations of COPCs migrating from groundwater and leachate to indoor air of an overlying building. Appendix J presents the model calculations and output. EPCs are presented in Table 5-17.

Calculation of outdoor air concentrations of VOCs in groundwater and leachate due to exposure to groundwater in an excavation trench is presented in Appendix K. These concentrations were used to evaluate the construction worker receptor. EPCs are presented in Table 5-16.

Concentrations of volatile COPCs in outdoor air due to migration from groundwater and soil were estimated using the methodology recommended by the American Society for Testing and Materials (ASTM, 2000). The RBCA Toolkit for Chemical Releases, Version 1.3a (GSI, 2001) was used to implement the standard. EPCs for volatile COPCs in groundwater and leachate listed in Table 5-15 were used as the source term for the groundwater modeling. EPCs for volatile COPCs in combined soils (Table 5-9) were used as the source term for the soil modeling. Appendix L presents the model calculations and output. These concentrations were used to evaluate the outdoor worker, construction worker, and the trespasser receptors. Table 5-10 presents the outdoor air EPCs modeled from soil. Table 5-18 presents the outdoor air EPCs modeled from mid-groundwater and leachate.

The calculation of concentrations of inorganic and semivolatile organic COPCs bound to soil in fugitive dust involves multiplying the soil exposure point concentrations by the concentration of dust in air as follows:

**1) Ambient Air:**

$$\text{COPC concentration in ambient air (mg/m}^3\text{)} = \text{Exposure point concentration in soil (mg/kg soil)} \times \text{Dust concentration (kg soil/m}^3\text{)}$$

The dust concentration in air used in the evaluation of ambient outdoor air pathways in this risk evaluation is the inverse of the particulate emission factor (PEF) derived in accordance with USEPA guidance (USEPA, 1996a). Table 5-19 presents the PEF calculations used for Site O (North), Table 5-20 presents the PEF calculations used for Site S, and Table 5-21 presents the PEF calculation for Site O, Site P, Site Q (North), Site Q (South), Site Q (Central) and Site R. Surface soil EPCs were used as the source term for modeling the dust concentration in ambient air.

**2) Excavation Air (i.e., during construction activities):**

$$\text{COPC concentration in excavation air (mg/m}^3\text{)} = \text{Exposure point concentration in soil (mg/kg soil)} \times \text{Dust concentration (mg soil/m}^3\text{)} \times \text{Unit correction factor (1 kg/10}^6\text{ mg)}$$

The dust concentration in air used in the evaluation of excavation air pathways in this risk evaluation is 60 ug/m<sup>3</sup>. This value is the recommended concentration of respirable particulate with a mean diameter of 10 microns or less (PM10) for excavation activities (MADEP, 1995). Combined soil EPCs were used as the source term for modeling the dust concentration in excavation air.

## **5.5 Constituent-Specific Parameters**

There are several constituent-specific parameters used in the exposure equations above. These parameters are discussed below.

### **5.5.1 Absorption Adjustment Factors**

Bioavailability is the measure of the degree to which a constituent may be systemically absorbed following exposure. In accordance with USEPA guidance (USEPA, 1989a, 1992c), absorption adjustment factors (AAFs) for bioavailability will be used in conducting this risk evaluation. To estimate the potential risk to human health that may be posed by the presence of COPCs in various environmental media (such as soil, sediment, water or air), it is first necessary to estimate the human

exposure dose of each constituent. The exposure dose is then combined with an estimate of the toxicity of the constituent to produce an estimate of risk posed to human health.

The estimate of toxicity of a constituent, termed the toxicity value, can be derived from human epidemiological data, but it is most often derived from experiments with laboratory animals. The toxicity value can be calculated based on the administered dose of the constituent (similar to the human exposure dose) or, when data are available, based on the absorbed dose, or internal dose, of the constituent.

*In animals, as in humans, the administered dose of a constituent is not necessarily completely absorbed. Moreover, differences in absorption exist between laboratory animals and humans, as well as between different media and routes of exposure. Therefore, it is not always appropriate to directly apply a toxicity value to the human exposure dose. In many cases, a correction factor in the calculation of risk is needed to account for differences between absorption in the toxicity study and absorption likely to occur upon human exposure to a constituent. Without such a correction, the estimate of human health risk could be over- or under-estimated.*

This correction factor is termed the absorption adjustment factor, or AAF. The AAF is used to adjust the human exposure dose so that it is expressed in the same terms as the doses used to generate the dose-response curve in the dose-response study. The AAF is the ratio between the estimated human absorption for the specific medium and route of exposure, and the known or estimated absorption for the laboratory study from which the dose-response value was derived.

$$AAF = \frac{\text{fraction absorbed in humans for the environmental exposure}}{\text{fraction absorbed in the dose - response study}}$$

The use of an AAF allows appropriate adjustments to be made to the administered dose of a constituent when the efficiency of absorption between environmental exposure and experimental exposure is known or expected to differ because of physiological effects and/or matrix or vehicle effects.

AAFs can have numerical values less than one or greater than one. When the toxicity curve is based on administered dose data, and if it is estimated that the fraction absorbed from the site-specific exposure or medium is the same as the fraction absorbed in the laboratory study, then the AAF is 1.0. This does not mean that there is 100% absorption, only that the magnitude of absorption is the same in both cases. There are situations in which it is expected that the fraction absorbed from a site-related exposure would be higher than that in the laboratory study. There are also situations where the reverse could occur. Thus, use of AAFs provides more accurate and more realistic estimates of potential human health risk. In the absence of detailed toxicological information on a COPC, the following default AAF values are generally employed. A default AAF value of 0.01 is used for dermal

exposure to organics, a value of 0.001 is used for dermal exposure to inorganics (USEPA, 2000a), and a value of 1.0 is employed for all other routes of exposure

#### Support for the Use of AAFs in Agency Guidance

The use of absorption factors is recommended by USEPA for use in risk assessment when the "medium of exposure in the site exposure assessment differs from the medium of exposure assumed by the toxicity value" (USEPA, 1989a). In more recent guidance (USEPA, 1992c), USEPA states

The applied dose, or the amount that reaches exchange boundaries of the skin, lung or gastrointestinal tract, may often be less than the potential dose if the material is only partly bioavailable. Where data on bioavailability are known, adjustments to the potential dose to convert it to applied dose and internal dose may be made.

This may be done by adding a bioavailability factor (range 0 to 1) to the dose equation. The bioavailability factor would then take into account the ability of the chemical to be extracted from the matrix, absorption through the exchange boundary, and any other losses between ingestion and contact with lung or gastrointestinal tract.

AAFs used in this risk assessment are presented in Table 5-22. Appendix H presents the derivations of the non-default AAFs.

#### **5.5.2 Skin Permeability Constants**

The estimation of exposure doses resulting from incidental dermal contact with groundwater requires the use of a dermal permeability constant (PC) in units of centimeters per hour (cm/hr). This method assumes that the behavior of constituents dissolved in water is described by Fick's Law. In Fick's Law, the steady-state flux of the solute across the skin ( $\text{mg}/\text{cm}^2/\text{hr}$ ) equals the permeability constant (pc, cm/hr) multiplied by the concentration difference of the solute across the membrane ( $\text{mg}/\text{cm}^3$ ). This approach is discussed by USEPA (USEPA, 1989a, 1992b).

The PC values were derived from USEPA's Guidance for Dermal Exposure Assessment: Principles and Applications (USEPA, 1992b). Tables 5-3 and 5-7 of this guidance document list PC values for constituents commonly found at disposal sites. PCs used in this risk assessment are presented in Table 5-23. For the COPCs lacking PCs in the USEPA guidance, PCs were calculated using the USEPA algorithms. The variables used and resulting calculated PCs are presented in Table 5-24.

TABLE 5-1

POTENTIAL RECEPTORS, EXPOSURE MEDIA AND EXPOSURE PATHWAYS  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Receptor	Site	Medium	Pathway
<b><u>On-Site Outdoor Industrial Worker</u></b>			
6 Receptors	O, O North, P, Q North, Q Central, Q South, R, S	Surface Soil	Incidental Ingestion Inhalation of Particulates/Volatiles (a) Dermal Contact
		Groundwater/ Leachate	Inhalation of Volatiles in Outdoor Air
<b><u>On-Site Indoor Industrial Worker</u></b>			
6 Receptors	O, O North, P, Q North, Q Central, Q South, R, S	Groundwater/ Leachate	Inhalation of Volatiles in Indoor Air
<b><u>Construction/Utility Worker</u></b>			
6 Receptors	O, O North, P, Q North, Q Central, Q South, R, S	Combined Soil	Incidental Ingestion Inhalation of Particulates/Volatiles Dermal Contact
		Groundwater/ Leachate	Incidental Ingestion Dermal Contact Inhalation of Volatiles in Excavation Air
<b><u>Trespassing Teenager</u></b>			
7 Receptors	O, O North, P, Q North, Q Central, Q South, R, S	Surface Soil	Incidental Ingestion Inhalation of Particulates/Volatiles (a) Dermal Contact
		Groundwater	Inhalation of Volatiles in Outdoor Air
	Mississippi River, Site Q Ponds	Surface Water	Incidental Ingestion Dermal Contact
		Sediment	Incidental Ingestion Dermal Contact
<b><u>Recreational Fisher</u></b>			
2 Receptors	Mississippi River, Site Q Ponds	Fish Fillets	Ingestion
		Surface Water	Incidental Ingestion Dermal Contact
		Sediment	Incidental Ingestion Dermal Contact
Total number of receptors = 27, each evaluated for Reasonable Maximum Exposure (RME) and Most Likely Exposure (MLE) scenarios			
(a) The inhalation of volatiles pathway was evaluated for combined soil			

TABLE 5-2

**SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - INDOOR INDUSTRIAL WORKER**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, ILLINOIS**

Parameter	RME On-Site Indoor Worker		MLE On-Site Indoor Worker	
Parameters Used in the Indoor Air Pathway				
Exposure Time (hr/day)	8	(a)	8	(a)
Exposure Frequency (days/year)	250	(b)	250	(b)
Exposure Duration (yr)	25	(b)	7	(c)
Inhalation Rate (m <sup>3</sup> /hour)	16	(d)	10	(e)
Body Weight (kg)	70	(b)	70	(b)
Notes				
MLE - Most Likely Exposure				
RME Reasonable Maximum Exposure				
(a) - USEPA, 1997a Exposure Factors Handbook 50th percentile time spent at work, males and females, all ages EFH Table 15-68				
(b) - USEPA, 1991a Standard Default Exposure Factors				
(c) - USEPA, 1997a Exposure Factors Handbook Recommended value for occupational tenure listed in EFH Table 1-2				
(d) - USEPA, 1997a Exposure Factors Handbook Inhalation rate for moderate activity listed in EFH Table 5-23				
(e) - USEPA, 1997a Exposure Factors Handbook Inhalation rate for light activity listed in EFH Table 5-23				

**TABLE 5-3**  
**SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - OUTDOOR INDUSTRIAL WORKER**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RVFS**  
**SAUGET, ILLINOIS**

Parameter	RME Future Outdoor Industrial Worker		MLE Future Outdoor Industrial Worker	
Parameters Used in the Outdoor Air Pathways				
Exposure Time (hr/day)	8	(a)	8	(a)
Exposure Frequency (days/year)	190	(i)	190	(i)
Exposure Duration (yr)	25	(b)	7	(c)
Inhalation Rate (m <sup>3</sup> /hour)	16	(d)	1	(e)
Body Weight (kg)	70	(b)	70	(b)
Parameters Used in the Surface Soil Pathway				
Exposure Frequency (days/year)	190	(i)	190	(i)
Exposure Duration (yr)	25	(b)	7	(c)
Soil Ingestion Rate (mg/day)	50	(f)	30	(j)
Skin Contacting Medium (cm <sup>2</sup> /day)	3339	(g)	3339	(g)
Soil on Skin (mg/cm <sup>2</sup> )	0.02	(h)	0.02	(h)
Body Weight (kg)	70	(b)	70	(b)
Notes				
MLE - Most Likely Exposure				
RME - Reasonable Maximum Exposure				
(a) - USEPA, 1997a Exposure Factors Handbook 50th percentile time spent at work, males and females, all ages EFH Table 15-68				
(b) - USEPA, 1991a Standard Default Exposure Factors				
(c) - USEPA, 1997a Exposure Factors Handbook Recommended value for occupational tenure listed in EFH Table 1-2				
(d) - USEPA, 1997a Exposure Factors Handbook Inhalation rate for moderate activity listed in EFH Table 5-23				
(e) - USEPA, 1997a Exposure Factors Handbook Inhalation rate for light activity listed in EFH Table 5-23				
(f) - USEPA, 1997a Exposure Factors Handbook Average soil ingestion rates listed in EFH Table 1-2				
(g) - USEPA, 1997a Exposure Factors Handbook Represents 50th percentile values for males and females based on hands, forearms, and face listed in EFH Tables 6-2 and 6-3				
(h) - USEPA, 1997a Exposure Factors Handbook See Table 5-7 of this HHRA for calculation				
(i) - Exposure frequency of 250 days (USEPA, 1991a) adjusted for percentage of days with inclement weather (24%), [250-(250*0.24) = 190], see text				
(j) - Calabrese, E. J., et al. 1990 Preliminary adult soil ingestion estimates, results of a pilot study Regul. Toxicol. Pharmacol. 12:88-95 As cited in USEPA, 1997a Exposure Factors Handbook Low end of range				

TABLE 5-4  
**SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - TRESPASSING TEENAGER**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, ILLINOIS**

Parameter	RME Trespassing Teenager (7 to 18 yrs)		MLE Trespassing Teenager (7 to 18 yrs)	
<b>Parameters Used in the Surface Soil Pathway</b>				
Exposure Frequency (days/year)	26	(a)	13	(b)
Exposure Duration (yr)	11	(c)	11	(c)
Soil Ingestion Rate (mg/day)	100	(d)	50	(e)
Skin Contacting Medium (cm^2/day)	4672	(f)	4672	(f)
Soil on Skin (mg/cm^2)	0.04	(g)	0.04	(g)
Body Weight (kg)	47	(h)	47	(h)
<b>Parameters Used in the Outdoor Air Pathway</b>				
Exposure Time (hr/day)	2	(i)	2	(i)
Exposure Frequency (days/year)	26	(a)	13	(b)
Exposure Duration (yr)	11	(c)	11	(c)
Inhalation Rate (m^3/hour)	1.2	(j)	1	(k)
Body Weight (kg)	47	(h)	47	(h)
<b>Parameters Used in the Sediment Pathway (l)</b>				
Exposure Frequency (days/year)	13	(b)	7	(m)
Exposure Duration (yr)	11	(c)	11	(c)
Soil Ingestion Rate (mg/day)	100	(d)	50	(e)
Skin Contacting Medium (cm^2/day)	6026	(f)	6026	(f)
Sediment on Skin (mg/cm^2)	1	(n)	1	(n)
Body Weight (kg)	47	(h)	47	(h)
<b>Parameters Used in the Surface Water (l)</b>				
Exposure Time (hr/day)	1	(o)	1	(o)
Exposure Frequency (days/year)	13	(b)	7	(m)
Exposure Duration (yr)	11	(c)	11	(c)
Water Ingestion Rate (L/day)	0.005	(p)	0.005	(p)
Skin Contacting Medium (cm^2/day)	6026	(f)	6026	(f)
Body Weight (kg)	47	(h)	47	(h)
<b>Notes</b>				
MLE - Most Likely Exposure				
RME - Reasonable Maximum Exposure				
(a) - 1 day per week for 26 weeks (6 months) of the year				
(b) - 1 day per 2 weeks for 26 weeks (6 months) of the year				
(c) - Trespassing teenager is assumed to range in age from 7 to 18. Therefore, total exposure duration is 11 years				
(d) - USEPA, 1991a Standard Default Exposure Factors				
(e) - USEPA, 1997a Exposure Factors Handbook Average soil ingestion rate for an adult listed in EFH Table 1-2				
(f) - USEPA, 1997a Exposure Factors Handbook Average surface area of head, feet, hands, forearms and lower legs of males and females aged 7 to 18 listed in EFH Tables 6-6 to 6-8				
(g) - USEPA, 1997a Exposure Factors Handbook See Table 5-7 of this report for calculation. Data for feet are not available, therefore, this value is based on hands, forearms, lower legs, and head				
(h) - USEPA, 1997a Exposure Factors Handbook Body weight is the average of males and females aged 7 to 18 listed in EFH Table 7-3				
(i) - The trespassing teen is assumed to be on-site for two hours				
(j) - USEPA, 1997a Exposure Factors Handbook Inhalation rates is the value for moderate activity (children) listed in EFH Table 5-23				
(k) - USEPA, 1997a Exposure Factors Handbook Inhalation rates is the value for light activity (children) listed in EFH Table 5-23				
(l) - Sediment and surface water exposures for the Mississippi River are evaluated separately from the Site Q Ponds, sediment and surface water exposures for the Site Q Ponds are evaluated in conjunction with the Site Q soil and air pathways				
(m) - One day per 4 weeks for approximately six months of the year				
(n) - USEPA, 1992b Dermal Exposure Assessment Principles and Applications				
(o) - Assumed duration of wading event				
(p) - USEPA, 1989a Risk Assessment Guidance for Superfund, Volume I Value is one-tenth of that assumed to occur during a swimming event				

TABLE 5-5  
SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - CONSTRUCTION WORKER  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Parameter	RME Future Construction/Utility Worker		MLE Future Construction/Utility Worker	
Parameters Used in the Surface Soil, Combined Soil and Groundwater/Leachate Inhalation Pathway				
Exposure Time (hr/day)	8	(a)	8	(a)
Exposure Frequency (days/year)	40	(b)	20	(c)
Exposure Duration (yr)	1	(d)	1	(d)
Inhalation Rate (m <sup>3</sup> /hour)	25	(e)	15	(f)
Body Weight (kg)	70	(g)	70	(g)
Parameters Used in the Surface and Combined Soil Pathway				
Exposure Frequency (days/year)	40	(b)	20	(c)
Exposure Duration (yr)	1	(d)	1	(d)
Soil Ingestion Rate (mg/day)	100	(g)	64	(h)
Skin Contacting Medium (cm <sup>2</sup> /day)	3339	(i)	3339	(i)
Soil on Skin (mg/cm <sup>2</sup> )	0.19	(j)	0.19	(j)
Body Weight (kg)	70	(g)	70	(g)
Parameters Used in the Groundwater/Leachate Pathway				
Exposure Time (hr/day)	1	(k)	1	(k)
Exposure Frequency (days/year)	10	(k)	5	(k)
Exposure Duration (yr)	1	(d)	1	(d)
Water Ingestion Rate (L/day)	0.005	(l)	0.005	(l)
Skin Contacting Medium (cm <sup>2</sup> /day)	3339	(i)	3339	(i)
Body Weight (kg)	70	(g)	70	(g)
Notes				
MLE - Most Likely Exposure				
RME - Reasonable Maximum Exposure				
(a) - USEPA, 1997a Exposure Factors Handbook 50th percentile time spent at work, males and females, all ages EFH Table 15-68				
(b) - Exposure frequency is equivalent to 5 days per week for 2 months				
(c) - Exposure frequency is equivalent to 5 days per week for 1 month				
(d) - Construction activities are assumed to occur within a 1 year period				
(e) - USEPA, 1997a Exposure Factors Handbook Inhalation rate is the value for heavy activity for an outdoor worker listed in EFH Table 5-23				
(f) - USEPA, 1997a Exposure Factors Handbook Inhalation rate is the value for moderate activity for an outdoor worker listed in EFH Table 5-23				
(g) - USEPA, 1991a Standard Default Exposure Factors				
(h) - ENSR-derived value, see text				
(i) - USEPA, 1997a Exposure Factors Handbook Represents 50th percentile values for males and females based on hands, forearms, and face listed in EFH Tables 6-2 and 6-3				
(j) - USEPA, 1997a Exposure Factors Handbook See Table 5-7 of this report for calculation				
(k) - Assumes that contact with water occurs only for a fraction of the total exposure duration and time				
(l) - USEPA, 1989a Risk Assessment Guidance for Superfund, Volume I Value is one-tenth of that assumed to occur during a swimming event				

TABLE 5-6

**SUMMARY OF POTENTIAL EXPOSURE ASSUMPTIONS - RECREATIONAL FISHER**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, ILLINOIS**

Parameter	RME Adult Recreational Fisher		MLE Adult Recreational Fisher	
<b>Parameters Used in the Fish Ingestion Pathway</b>				
Exposure Frequency (days/year)	365	(a)	365	(a)
Exposure Duration (yr)	30	(b)	9	(c)
Fish Ingestion Rate (kg/day)	0 008	(d)	0 001	(e)
Body Weight (kg)	70	(b)	70	(b)
<b>Parameters Used in the Surface Water Pathway - Wading</b>				
Exposure Time (hr/day)	1	(k)	1	(k)
Exposure Frequency (days/year)	22	(h)	3	(i)
Exposure Duration (yr)	30	(b)	9	(c)
Surface Water Ingestion Rate (L/day)	0 01	(f)	0 005	(j)
Skin Contacting Medium (cm^2)	6934	(g)	6934	(g)
Body Weight (kg)	70	(b)	70	(b)
<b>Parameters Used in the Sediment Pathway - Wading</b>				
Exposure Frequency (days/year)	22	(h)	3	(i)
Exposure Duration (yr)	30	(b)	9	(c)
Sediment Ingestion Rate (mg/day)	100	(b)	50	(m)
Skin Contacting Medium (cm^2/day)	6934	(g)	6934	(g)
Sediment on Skin (mg/cm^2)	1	(l)	1	(l)
Body Weight (kg)	70	(b)	70	(b)
<b>Notes</b>				
MLE - Most Likely Exposure				
RME - Reasonable Maximum Exposure				
(a) - Fish ingestion rates are based on 365 days per year				
(b) - USEPA, 1991a Standard Default Exposure Factors				
(c) - USEPA, 1997a Exposure Factors Handbook Recommended average for time residing in a household EFH Table 1-2				
(d) - USEPA, 1997a Exposure Factors Handbook 8 g/day is equivalent to approximately 22 fish meals of 129 g per year				
(e) - 1 g/day is equivalent to approximately three 129 g fish meals per year (equivalent to one fish meal per month in the three summer months)				
(f) - USEPA, 1989a Risk Assessment Guidance for Superfund, Volume I Value is one-fifth of that assumed to occur during a swimming event				
(g) - USEPA, 1997a Exposure Factors Handbook Represents 50th percentile values for adult males and females based on hands, lower arms, lower legs, feet and head				
(h) - One day per week for 5 months				
(i) - One day per month during the three summer months				
(j) - USEPA, 1989a Risk Assessment Guidance for Superfund, Volume I Value is one-tenth of that assumed to occur during a swimming event				
(k) - Assumed duration of wading event				
(l) - USEPA, 1992b Dermal Exposure Assessment Principles and Applications				
(m) - USEPA, 1997a Exposure Factors Handbook Average soil ingestion rate for an adult listed in EFH Table 1-2				

TABLE 5-7  
SOIL ADHERENCE FACTORS  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINIOS

Body Part	Outdoor Industrial Worker Scenario		
	Surface Area 50th percentile (cm <sup>2</sup> ) (a)	Soil Loading Groundskeeper (mg/cm <sup>2</sup> ) (b)	Total Soil Mass (mg)
Head	1 205	0 005	5 543
Hands	904	0 071	64 1485
Forearms	1 230	0 009	11 1438
Total	3,339		80 8
Area-Weighted Soil Adherence factor (mg/cm2) = Soil mass/Surface area =			0 02
Notes			
(a) - Data from USEPA (1997a), Tables 6-2, 6-3 Average of 50th percentile values for men and women (1/2 arm used as proxy for female forearm)			
(b) - Data from USEPA (1997a), Table 6-12 Average of Groundskeeper Nos. 1,2,3,4, and 5			

Body Part	Construction Worker Scenario		
	Surface Area 50th percentile (cm <sup>2</sup> ) (a)	Soil Loading Farmer (mg/cm <sup>2</sup> ) (a)	Total Soil Mass (mg)
Head	1,205	0 041	49 405
Hands	904	0 47	424 645
Forearms	1 230	0 13	159 9
Total	3,339		634 0
Area-Weighted Soil Adherence factor (mg/cm2) = Soil mass/Surface area =			0 19
Notes			
(a) - Data from USEPA (1997a), Tables 6-2, 6-3 Average of 50th percentile values for men and women (1/2 arm used as proxy for female forearm)			
(b) - Data from USEPA (1997a), Table 6-12 Average of Farmer Nos. 1 and 2			

Body Part	Trespassing Teenager (7 to 18 years)		
	Surface Area 50th percentile (a) (cm <sup>2</sup> )	Soil Loading Soccer No. 1 (mg/cm <sup>2</sup> ) (b)	Total Soil Mass (mg)
Hands	715	0 1100	78 65
Forearms	894	0 0110	9 83
Lower legs	2 068	0 0310	64 11
Head	995	0 0120	11 94
Total	4 672	--	164 53
Area-Weighted Soil Adherence factor (mg/cm2) = Soil mass/Surface area =			0 04
Notes			
(a) Data from USEPA (1997a) Based on average of boys (EFH Table 6-6) and girls (EFH Table 6 7) total body surface area and mean percentages of total surface area for individual body parts EFH Table 6 8)			
(b) Data from USEPA (1997a) Table 6 12 Soccer No. 1 (measurements of boys aged 13-15) Measurements were not collected from feet therefore adherence factor is based on hands, forearms lower legs and head This factor is applied to the total body surface area of 6 026 cm^2 calculated in Table 5-4 which includes feet			

TABLE 5-8  
EXPOSURE POINT CONCENTRATIONS - SURFACE SOIL  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

ENSR INTERNATIONAL

Constituent	CAS	EPC - MLE Scenario (mg/kg) (a)								EPC - RME Scenario (mg/kg) (b)							
		O	O North	P	Q North	Q Central	Q South	R	S	O	O North	P	Q North	Q Central	Q South	R	S
<b>SVOCs</b>																	
2,4,6-Trichlorophenol	88-06-2	--	--	--	--	--	--	--	4.19E+00	--	--	--	--	--	--	--	8.20E+00
2-Nitroaniline	88-74-4	--	--	--	--	--	--	--	2.78E+00	--	--	--	--	--	--	--	4.60E+00
4-Nitroaniline	100-01-6	--	--	--	--	--	--	--	2.90E+01	--	--	--	--	--	--	--	5.70E+01
Benzo(a)anthracene	56-55-3	--	--	--	--	--	5.57E-01	--	4.05E+00	--	--	--	--	--	1.03E+00	--	8.00E+00
Benzo(a)pyrene	50-32-8	--	--	3.01E-01	1.24E+00	--	5.98E-01	--	2.77E+00	--	--	6.70E-01	1.80E+00	--	1.05E+00	--	5.40E+00
Benzo(b)fluoranthene	205-99-2	--	--	--	--	--	7.26E-01	--	3.42E+00	--	--	--	--	--	1.35E+00	--	6.60E+00
Dibenzo(a,h)anthracene	53-70-3	--	--	--	2.12E-01	--	--	--	9.93E-01	--	--	--	3.70E-01	--	--	--	1.80E+00
<b>Pesticides</b>																	
4,4'-DDT	50-29-3	--	--	--	--	--	--	--	8.01E+00	--	--	--	--	--	--	--	1.60E+01
beta-BHC	319-85-7	--	--	--	--	--	--	--	1.30E+01	--	--	--	--	--	--	--	2.60E+01
Dieldrin	60-57-1	9.10E-02	--	--	--	--	7.96E-02	--	--	1.80E-01	--	--	--	--	2.69E-01	--	--
gamma-BHC (Lindane)	58-89-9	--	--	--	--	--	--	--	3.75E+00	--	--	--	--	--	--	--	7.50E+00
Heptachlor	76-44-8	--	--	--	--	--	--	--	7.50E-01	--	--	--	--	--	--	--	1.50E+00
<b>Herbicides</b>																	
Pentachlorophenol	87-86-5	--	--	--	--	--	--	--	2.20E+02	--	--	--	--	--	--	--	4.40E+02
<b>PCBs</b>																	
Total PCBs	1336-36-3	5.40E+00	7.09E+02	1.78E+00	5.73E-01	1.08E+00	2.75E+00	--	5.04E+02	1.08E+01	7.09E+02	7.02E+00	1.87E+00	2.57E+00	5.10E+00	--	1.01E+03
<b>Dioxin</b>																	
2,3,7,8-TCDD-TEQ	1746-01-6	2.99E-03	5.08E-02	--	--	1.14E-03	6.89E-04	--	--	5.93E-03	5.08E-02	--	--	3.31E-03	1.69E-03	--	--
<b>Metals</b>																	
Antimony	7440-36-0	--	--	--	--	--	6.95E+00	--	--	--	--	--	--	--	1.43E+01	--	--
Arsenic	7440-38-2	--	--	1.41E+01	--	7.30E+00	9.66E+00	--	--	--	--	2.60E+01	--	1.30E+01	1.35E+01	--	--
Cadmium	7440-43-9	--	--	--	2.01E+01	--	--	--	--	--	--	--	9.20E+01	--	--	--	--
Chromium	7440-47-3	--	--	--	--	--	8.41E+01	--	--	--	--	--	--	--	1.81E+02	--	--
Manganese	7439-96-5	--	--	--	--	--	6.03E+02	--	--	--	--	--	--	--	8.60E+02	--	--
Mercury	7439-97-6	--	4.30E+01	--	--	--	--	--	--	--	4.30E+01	--	--	--	--	--	--

Notes

-- Not a constituent of potential concern in this location

CAS - Chemical Abstracts Service

EPC - Exposure Point Concentration

MLE - Most Likely Exposure

PCBs - Polychlorinated Biphenyls

RME - Reasonable Maximum Exposure

SVOCs - Semivolatile Organic Compounds

TCDD-TEQ - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration

(a) Average concentration

(b) Lower of the 95% upper confidence limit and the maximum detected concentration. Selection shown in Appendix I

TABLE 5-9  
EXPOSURE POINT CONCENTRATIONS - COMBINED SOIL (a)  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET ILLINOIS

Constituent	CAS	EPC - MLE Scenario (mg/kg) (b)								EPC - RME Scenario (mg/kg) (c)								
		O	O North	P	Q North	Q Central	Q South	R	S	O	O North	P	Q North	Q Central	Q South	R	S	
VOCs																		
1,1,2-Trichloroethane	79-00-5	-	-	-	-	-	-	1.69E+00	-	-	-	-	-	-	-	3.18E+00	-	
1,2-Dichloroethane	107-06-2	-	-	-	3.23E-01	-	-	1.68E+01	-	-	-	-	7.43E-01	-	-	3.28E+01	-	
1,2-Dichloroethane (total)	540-59-0	-	-	-	-	-	-	6.18E+00	-	-	-	-	-	-	-	1.37E+01	-	
4-Methyl-2-pentanone (MIBK)	108-10-1	-	-	-	-	-	-	-	1.03E+02	-	-	-	-	-	-	-	4.00E+02	
Benzene	71-43-2	9.64E+01	4.35E+01	6.62E-01	6.77E-01	-	1.34E-01	2.62E+01	1.18E+01	5.00E+02	6.90E+01	1.12E+00	1.61E+00	-	2.98E-01	5.22E+01	3.50E+01	
Chlorobenzene	108-90-7	2.20E+02	3.22E+02	-	-	-	-	2.33E+02	2.65E+02	7.60E+02	4.80E+02	-	-	-	-	5.89E+02	1.20E+03	
Chloroform	67-66-3	-	-	-	-	-	-	2.79E+00	-	-	-	-	-	-	-	4.93E+00	-	
Dichloromethane	75-09-2	-	3.67E+01	-	-	-	-	-	1.64E+01	-	8.70E+01	-	-	-	-	-	5.70E+01	
Ethylbenzene	100-41-4	4.85E+02	5.05E+02	8.69E+00	3.47E+00	-	1.36E+01	9.04E+00	3.01E+02	2.80E+03	7.60E+02	7.80E+01	7.78E+00	-	3.53E+01	1.62E+01	1.10E+03	
Tetrachloroethene	127-18-4	-	3.55E+00	1.31E+01	1.95E+00	-	-	2.25E+02	1.30E+01	-	6.80E+00	1.54E+01	4.90E+00	-	-	4.45E+02	3.30E+01	
Toluene	108-88-3	6.95E+01	-	-	-	-	-	6.50E+01	1.78E+02	1.35E+03	3.90E+02	-	-	-	-	1.69E+02	3.15E+02	6.00E+03
Trichloroethylene	79-01-6	-	-	2.01E-01	1.07E-01	-	-	2.18E-02	2.53E+02	5.41E+01	-	-	9.90E-01	2.06E-01	-	5.16E-02	2.20E+03	2.40E+02
Xylenes Total	1330-20-7	2.46E+03	2.59E+03	4.02E+01	2.55E+01	-	-	9.53E+01	4.53E+01	1.77E+03	1.40E+04	3.90E+03	3.80E+02	5.79E+01	-	2.52E+02	8.88E+01	7.30E+03
SVOCs																		
1,2-Dichlorobenzene	95-50-1	-	2.47E+02	-	-	-	-	-	-	-	5.20E+02	-	-	-	-	-	-	
1,3-Dichlorobenzene	541-73-1	-	5.93E+00	-	-	-	-	-	3.39E+00	-	1.20E+01	-	-	-	-	-	1.20E+01	
1,4-Dichlorobenzene	106-46-7	1.87E+01	6.37E+01	2.44E+01	-	-	-	2.51E+00	3.90E+01	4.70E+01	1.20E+02	6.70E+01	-	-	-	6.42E+00	2.00E+02	
2,4,6-Trichlorophenol	88-06-2	2.58E+00	2.41E+01	-	3.90E+00	-	-	7.34E+01	3.03E+00	6.90E+00	6.10E+01	-	9.77E+00	-	-	1.70E+02	8.20E+00	
2,4-Dichlorophenol	120-83-2	-	-	-	2.29E+01	-	-	3.27E+02	-	-	-	-	5.19E+01	-	-	8.47E+02	-	
2-Chlorophenol	95-57-8	-	-	-	-	-	-	3.73E+01	-	-	-	-	-	-	-	9.51E+01	-	
2-Methylnaphthalene	91-57-6	-	8.27E+01	-	-	-	-	-	-	-	2.00E+02	-	-	-	-	-	-	
2-Nitroaniline	88-74-4	1.13E+00	2.30E+01	-	3.81E+00	-	-	1.52E+00	2.16E+00	2.50E+00	6.20E+01	-	6.18E+00	-	-	2.81E+00	4.60E+00	
4-Nitroaniline	100-01-6	-	3.43E+02	-	-	-	-	4.12E+00	1.94E+01	-	1.00E+03	-	-	-	-	8.34E+00	5.70E+01	
Benzo(a)anthracene	56-55-3	4.61E+00	1.53E+01	-	1.23E+00	6.07E-01	5.92E-01	-	2.96E+00	1.20E+01	3.60E+01	-	1.61E+00	1.07E+00	1.03E+00	-	8.00E+00	
Benzo(a)pyrene	50-32-8	2.88E+00	6.52E+00	2.63E-01	1.32E+00	6.42E-01	6.83E-01	-	2.32E+00	7.10E+00	1.10E+01	6.70E-01	1.67E+00	1.24E+00	1.14E+00	-	5.40E+00	
Benzo(b)fluoranthene	205-99-2	3.17E+00	6.13E+00	-	1.18E+00	7.82E-01	7.09E-01	-	2.65E+00	7.90E+00	1.20E+01	-	1.51E+00	1.60E+00	1.18E+00	-	6.60E+00	
bis(2-Chloroethyl)ether	111-44-4	-	1.14E+00	-	-	-	-	-	-	-	2.10E+00	-	-	-	-	-	-	
bis(2-Ethylhexyl)phthalate	117-81-7	-	-	-	-	-	-	5.03E+01	-	-	-	-	-	-	-	-	1.30E+02	
Dibenzo(a,h)anthracene	53-70-3	8.52E-01	2.13E+00	-	2.11E-01	-	-	-	9.93E-01	3.00E+00	4.60E+00	-	2.82E-01	-	-	-	1.80E+00	
Hexachlorobenzene	118-74-1	-	1.94E+00	-	-	-	-	-	-	-	4.50E+00	-	-	-	-	-	-	
Naphthalene	91-20-3	-	1.84E+01	-	-	-	-	1.17E+01	2.10E+01	-	4.10E+01	-	-	-	-	2.94E+01	4.80E+01	
Nitrobenzene	98-95-3	-	4.11E+00	-	-	-	-	6.63E+00	-	-	1.10E+01	-	-	-	-	1.45E+01	-	
Pesticides																		
4,4-DDE	72-55-9	-	1.70E+01	-	-	-	-	-	-	-	3.30E+01	-	-	-	-	-	-	
4,4-DDT	50-29-3	-	2.04E+01	-	-	-	-	2.83E+00	-	-	5.80E+01	-	-	-	-	-	1.60E+01	
Aldrin	309-00-2	1.46E-01	2.20E+00	-	-	1.89E-02	3.92E-02	-	6.05E-02	7.20E-01	4.50E+00	-	-	3.40E-02	6.78E-02	-	1.90E-01	
alpha-BHC	319-84-6	-	5.99E-01	-	-	-	-	-	-	-	1.50E+00	-	-	-	-	-	-	
beta-BHC	319-85-7	-	7.26E+00	-	-	-	-	3.49E-01	4.38E+00	-	2.10E+01	-	-	-	-	7.53E-01	2.60E+01	
delta-BHC	319-86-8	9.17E-01	-	-	-	-	-	-	-	2.85E+00	-	-	-	-	-	-	-	
Dieldrin	60-57-1	1.27E+00	1.95E+01	1.26E-01	3.45E-01	7.01E-02	1.33E-01	3.41E-01	1.13E-01	3.80E+00	5.00E+01	2.83E-01	5.84E-01	1.47E-01	5.04E-01	1.22E+00	3.80E-01	
gamma-BHC (Lindane)	58-89-9	5.06E-01	-	-	-	-	-	-	1.27E+00	2.88E+00	-	-	-	-	-	-	7.50E+00	
Heptachlor	76-44-8	7.86E-01	3.40E+00	-	-	-	-	1.86E-01	2.73E-01	2.78E+00	9.90E+00	-	-	-	-	4.45E-01	1.50E+00	
Heptachlor Epoxide	1024-57-3	1.46E-01	1.25E+00	-	-	-	3.76E-02	-	-	4.70E-01	2.70E+00	-	-	-	1.03E-01	-	-	
Herbicides																		
MCPA	94-74-6	-	-	2.16E+01	-	-	-	-	-	-	5.26E+01	-	-	-	-	-	-	

TABLE 5-9  
EXPOSURE POINT CONCENTRATIONS - COMBINED SOIL (a)  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET ILLINOIS

Constituent	CAS	EPC - MLE Scenario (mg/kg) (b)								EPC - RME Scenario (mg/kg) (c)							
		O	O North	P	Q North	Q Central	Q South	R	S	O	O North	P	Q North	Q Central	Q South	R	S
MCPP	93-65-2	--	--	--	--	--	--	4 67E+01	--	--	--	--	--	--	--	6 18E+01	--
Pentachlorophenol	87-86-5	--	--	--	6 54E+01	1 63E+00	3 57E+01	--	1 15E+02	--	--	--	1 63E+02	6 52E+00	7 74E+01	--	4 40E+02
<b>PCBs</b>																	
Total PCBs	1336-36-3	6 97E+01	1 78E+03	4 44E+00	2 93E+01	2 40E+00	5 66E+00	4 12E+01	1 76E+02	2 98E+02	3 03E+03	1 69E+01	5 40E+01	4 35E+00	1 90E+01	8 89E+01	1 01E+03
<b>Dioxin</b>																	
2 3 7 8-TCDD-TEQ	1746-01-6	6 41E-03	3 25E-01	2 83E-04	5 24E-03	2 42E-03	2 15E-03	1 31E-03	4 67E-03	3 04E-02	4 97E-01	4 42E-04	1 11E-02	3 79E-03	4 51E-03	1 78E-03	2 59E-02
<b>Metals</b>																	
Antimony	7440-36-0	--	--	--	7 77E+00	--	1 15E+01	--	--	--	--	--	1 66E+01	--	1 87E+01	--	--
Arsenic	7440-38-2	--	2 00E+01	1 29E+01	1 18E+01	1 47E+01	1 31E+01	6 12E+00	--	--	3 70E+01	1 69E+01	1 54E+01	2 22E+01	1 72E+01	7 32E+00	--
Barium	7440-39-3	--	--	--	1 38E+03	--	--	--	--	--	--	--	3 03E+03	--	--	--	--
Cadmium	7440-43-9	--	3 93E+01	1 07E+01	1 23E+01	--	--	--	--	--	8 60E+01	1 33E+01	1 89E+01	--	--	--	--
Chromium	7440-47-3	--	--	--	--	--	8 82E+01	--	1 79E+02	--	--	--	--	--	1 30E+02	--	4 80E+02
Copper	7440-50-8	--	--	--	--	2 29E+03	--	--	--	--	--	--	--	6 41E+03	--	--	--
Lead	7439-92-1	--	--	--	1 96E+03	--	8 28E+02	--	8 38E+02	--	--	--	1 96E+03	--	8 28E+02	--	8 38E+02
Manganese	7439-96-5	--	--	--	--	8 42E+02	7 01E+02	--	--	--	--	--	--	1 29E+03	8 53E+02	--	--
Mercury	7439-97-6	--	1 65E+02	--	--	--	2 58E+00	2 51E+02	--	--	3 60E+02	--	--	--	3 58E+00	6 99E+02	--
Nickel	7440-02-0	--	--	--	--	--	2 14E+02	--	--	--	--	--	--	--	4 31E+02	--	--

Notes

"- " Not a constituent of potential concern in this location

CAS - Chemical Abstracts Service

EPC - Exposure point concentration

MCPP - 2-Methyl-4-chlorophenoxyacetic acid

MCPP - 2-(2-Methyl-4-chlorophenoxy) propionic acid

MLE - Most Likely Exposure

PCBs - Polychlorinated Biphenyls

RME - Reasonable Maximum Exposure

SVOCs - Semivolatile Organic Compounds

TCDD-TEQ - 2 3 7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration

VOCs - Volatile Organic Compounds

(a) Combined soil is comprised of surface soil, subsurface soil and waste

(b) Average concentration

(c) Lower of the 95% upper confidence limit and the maximum detected concentration. Selection shown in Appendix I. RME EPCs for Lead are averages

TABLE 5-10  
EXPOSURE POINT CONCENTRATIONS - OUTDOOR AIR CONCENTRATIONS - MODELED FROM SOIL (a) (b)  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Constituent	CAS	EPC - MLE Scenario (mg/m <sup>3</sup> )								EPC - RME Scenario (mg/m <sup>3</sup> )							
		O	O North	P	Q North	Q Central	Q South	R	S	O	O North	P	Q North	Q Central	Q South	R	S
<b>VOCs (a)</b>																	
1,1,2-Trichloroethane	79-00-5	--	--	--	--	--	--	2.7E-05	--	--	--	--	--	--	--	5.0E-05	--
1,2-Dichloroethane	107-06-2	--	--	--	3.7E-05	--	--	1.5E-04	--	--	--	--	8.5E-05	--	--	2.9E-04	--
1,2-Dichloroethene (total)	540-59-0	--	--	--	--	--	--	5.4E-05	--	--	--	--	--	--	--	1.2E-04	--
4-Methyl-2-pentanone (MIBK)	108-10-1	--	--	--	--	--	--	--	5.1E-03	--	--	--	--	--	--	--	2.0E-02
Benzene	71-43-2	6.7E-03	4.1E-03	1.3E-04	7.8E-05	--	1.5E-05	2.4E-04	1.1E-04	3.5E-02	6.6E-03	2.2E-04	1.9E-04	--	3.4E-05	4.8E-04	3.2E-04
Chlorobenzene	108-90-7	1.5E-02	3.1E-02	--	--	--	--	1.1E-03	1.3E-03	5.2E-02	4.6E-02	--	--	--	--	2.8E-03	5.8E-03
Chloroform	67-66-3	--	--	--	--	--	--	2.2E-05	--	--	--	--	--	--	--	3.9E-05	--
Dichloromethane	75-09-2	--	3.5E-03	--	--	--	--	--	2.5E-04	--	8.3E-03	--	--	--	--	--	8.6E-04
Ethylbenzene	100-41-4	3.3E-02	4.8E-02	1.4E-03	4.0E-04	--	1.6E-03	3.5E-05	1.2E-03	1.9E-01	7.2E-02	1.3E-02	8.9E-04	--	4.1E-03	6.2E-05	4.2E-03
Tetrachloroethene	127-18-4	--	3.4E-04	2.5E-03	2.2E-04	--	--	1.4E-03	8.4E-05	--	6.5E-04	3.0E-03	5.6E-04	--	--	2.9E-03	2.1E-04
Toluene	108-88-3	4.8E-03	--	--	--	--	--	7.5E-03	1.2E-03	8.7E-03	2.7E-02	--	--	--	1.9E-02	2.0E-03	3.9E-02
Trichloroethylene	79-01-6	--	--	3.9E-05	1.2E-05	--	2.5E-06	5.2E-03	1.1E-03	--	--	1.9E-04	2.4E-05	--	5.9E-06	4.5E-02	5.0E-03
Xylenes Total	1330-20-7	1.7E-01	2.5E-01	7.4E-03	2.9E-03	--	1.1E-02	2.2E-04	8.4E-03	9.7E-01	3.7E-01	7.0E-02	6.7E-03	--	2.9E-02	4.2E-05	3.5E-02
<b>SVOCs (b)</b>																	
2,4,6-Trichlorophenol	88-06-2	--	--	--	--	--	--	--	5.72E-09	--	--	--	--	--	--	--	1.12E-08
2-Nitroaniline	88-74-4	--	--	--	--	--	--	--	3.78E-09	--	--	--	--	--	--	--	6.27E-09
4-Nitroaniline	100-01-6	--	--	--	--	--	--	--	3.95E-08	--	--	--	--	--	--	--	7.77E-08
Benzo(a)anthracene	56-55-3	--	--	--	--	--	7.60E-10	--	5.52E-09	--	--	--	--	--	1.40E-09	--	1.09E-08
Benzo(a)pyrene	50-32-8	--	--	4.10E-10	1.69E-09	--	8.16E-10	--	3.77E-09	--	--	9.13E-10	2.45E-09	--	1.43E-09	--	7.36E-09
Benzo(b)fluoranthene	205-99-2	--	--	--	--	--	9.89E-10	--	4.66E-09	--	--	--	--	--	1.84E-09	--	9.00E-09
Dibenzo(a,h)anthracene	53-70-3	--	--	--	2.89E-10	--	--	--	1.35E-09	--	--	--	5.04E-10	--	--	--	2.45E-09
<b>Pesticides (b)</b>																	
4,4'-DDT	50-29-3	--	--	--	--	--	--	--	1.09E-08	--	--	--	--	--	--	--	2.18E-08
beta-BHC	319-85-7	--	--	--	--	--	--	--	1.77E-08	--	--	--	--	--	--	--	3.54E-08
Dieldrin	60-57-1	1.24E-10	--	--	--	--	1.09E-10	--	--	2.45E-10	--	--	--	--	3.67E-10	--	--
gamma-BHC (Lindane)	58-89-9	--	--	--	--	--	--	--	5.11E-09	--	--	--	--	--	--	--	1.02E-08
Heptachlor	76-44-8	--	--	--	--	--	--	--	1.02E-09	--	--	--	--	--	--	--	2.04E-09
<b>Herbicides (b)</b>																	
Pentachlorophenol	87-86-5	--	--	--	--	--	--	--	3.00E-07	--	--	--	--	--	--	--	6.00E-07
<b>PCBs (b)</b>																	
Total PCBs	1336-36-3	7.36E-09	6.43E-07	2.43E-09	7.81E-10	1.47E-09	3.75E-09	--	6.88E-07	1.47E-08	6.43E-07	9.57E-09	2.55E-09	3.51E-09	6.95E-09	--	1.37E-06
<b>Dioxin (b)</b>																	
2,3,7,8 TCDD-TEQ	1746-01-6	4.07E-12	4.61E-11	--	--	1.55E-12	9.40E-13	--	--	8.08E-12	4.61E-11	--	--	4.51E-12	2.30E-12	--	--

TABLE 5-10  
EXPOSURE POINT CONCENTRATIONS - OUTDOOR AIR CONCENTRATIONS - MODELED FROM SOIL (a) (b)  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Constituent	CAS	EPC - MLE Scenario (mg/m <sup>3</sup> )								EPC - RME Scenario (mg/m <sup>3</sup> )							
		O	O North	P	Q North	Q Central	Q South	R	S	O	O North	P	Q North	Q Central	Q South	R	S
<b>Metals (b)</b>																	
Antimony	7440 36 0	-	--	--	--	-	9 48E-09	--	--	--	--	--	--	--	1 95E-08	--	-
Arsenic	7440 38 2	-	--	1 92E-08	--	9 95E-09	1 32E-08	--	--	--	--	3 54E-08	--	1 77E-08	1 84E-08	--	--
Cadmium	7440 43-9	-	--	--	2 75E-08	--	--	--	--	--	--	--	1 25E-07	--	--	-	-
Chromium	7440-47 3	-	--	--	--	--	1 15E-07	--	--	--	--	--	--	--	2 47E-07	-	-
Manganese	7439 96 5	-	--	--	--	--	8 23E-07	--	--	--	--	--	--	--	1 17E 06	--	--
Mercury	7439 97-6	-	3 90E-08	--	--	--	--	--	--	--	3 90E-08	--	--	--	--	--	--
<b>Notes</b>																	
"--" Not a constituent of potential concern in this location																	
CAS - Chemical Abstracts Service																	
EPC - Exposure Point Concentration																	
MLE - Most Likely Exposure																	
PCBs - Polychlorinated Biphenyls																	
RME - Reasonable Maximum Exposure																	
SVOCs - Semivolatile Organic Compounds																	
TCDD-TEQ - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration																	
VOCs - Volatile Organic Compounds																	
(a) Concentration of VOCs in outdoor air (mg/m <sup>3</sup> ) were modeled from EPCs in combined soil (Table 5-9) using the RBCA Tool Kit (version 1 3a) in Appendix L																	
(b) Concentration of non-VOCs in outdoor air (mg/m <sup>3</sup> ) = EPCs in surface soil (mg/kg) (Table 5-8) / particulate emission factor (PEF) (m <sup>3</sup> /kg) PEFs are calculated in Tables 5-19 through 5-21																	

TABLE 5-11  
EXPOSURE POINT CONCENTRATIONS - EXCAVATION AIR - MODELED FROM COMBINED SOIL  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Constituent	CAS	EPC - MLE Scenario (mg/m3)								EPC - RME Scenario (mg/m3)							
		O	O North	P	Q North	Q Central	Q South	R	S	O	O North	P	Q North	Q Central	Q South	R	S
VOCs (a)																	
1,1,2-Trichloroethane	79-00-5	--	--	--	--	--	--	1.3E-04	--	--	--	--	--	--	--	2.5E-04	--
1,2-Dichloroethane	107-06-2	--	--	--	2.9E-04	--	--	7.4E-04	--	--	--	6.8E-04	--	--	--	1.4E-03	--
1,2-Dichloroethene (total)	540-59-0	--	--	--	--	--	--	2.7E-04	--	--	--	--	--	--	--	5.9E-04	--
4-Methyl-2-pentanone (MIBK)	108-10-1	--	--	--	--	--	--	--	2.5E-02	--	--	--	--	--	--	--	9.9E-02
Benzene	71-43-2	1.7E-01	7.6E-02	1.1E-03	1.2E-03	--	2.3E-04	1.2E-03	5.4E-04	8.6E-01	1.2E-01	1.9E-03	2.8E-03	--	5.2E-04	2.4E-03	1.6E-03
Chlorobenzene	108-90-7	1.6E-01	2.3E-01	--	--	--	--	5.6E-03	6.4E-03	5.4E-01	3.4E-01	--	--	--	--	1.4E-02	2.9E-02
Chloroform	67-66-3	--	--	--	--	--	--	1.1E-04	--	--	--	--	--	--	--	1.9E-04	--
Dichloromethane	75-09-2	--	8.3E-02	--	--	--	--	--	1.2E-03	--	2.0E-01	--	--	--	--	--	4.3E-03
Ethylbenzene	100-41-4	3.9E-01	4.1E-01	7.1E-03	2.8E-03	--	1.1E-02	1.7E-04	5.8E-03	2.3E+00	6.2E-01	6.4E-02	6.3E-03	--	2.9E-02	3.1E-04	2.1E-02
Tetrachloroethene	127-18-4	--	6.3E-03	2.3E-02	3.5E-03	--	--	7.2E-03	4.2E-04	--	1.2E-02	2.8E-02	8.8E-03	--	--	1.4E-02	1.1E-03
Toluene	108-88-3	8.7E-02	--	--	--	--	8.1E-02	5.8E-03	4.4E-02	4.9E-01	--	--	--	--	2.1E-01	1.0E-02	1.9E-01
Trichloroethylene	79-01-6	--	--	3.2E-04	1.7E-04	--	3.4E-05	2.6E-02	5.6E-03	--	--	1.6E-03	3.2E-04	--	8.1E-05	2.3E-01	2.5E-02
Xylenes Total	1330-20-7	2.3E+00	2.4E+00	3.7E-02	2.3E-02	--	8.8E-02	1.1E-03	4.2E-02	1.3E+01	3.6E+00	3.5E-01	5.3E-02	--	2.3E-01	2.1E-03	1.7E-01
SVOCs (b)																	
1,2-Dichlorobenzene	95-50-1	--	1.48E-05	--	--	--	--	--	--	--	3.12E-05	--	--	--	--	--	--
1,3-Dichlorobenzene	541-73-1	--	3.56E-07	--	--	--	--	--	2.03E-07	--	7.20E-07	--	--	--	--	--	7.20E-07
1,4-Dichlorobenzene	106-46-7	1.12E-06	3.82E-08	1.47E-06	--	--	--	1.51E-07	2.34E-06	2.82E-06	7.20E-06	4.02E-06	--	--	--	3.85E-07	1.20E-05
2,4,6-Trichlorophenol	88-06-2	1.55E-07	1.44E-06	--	2.34E-07	--	--	4.41E-06	1.82E-07	4.14E-07	3.68E-06	--	5.86E-07	--	--	1.02E-05	4.92E-07
2,4-Dichlorophenol	120-83-2	--	--	--	1.38E-06	--	--	1.98E-05	--	--	--	--	3.11E-06	--	--	5.08E-05	--
2-Chlorophenol	95-57-8	--	--	--	--	--	--	2.24E-06	--	--	--	--	--	--	--	5.71E-06	--
2-Methylnaphthalene	91-57-6	--	4.96E-06	--	--	--	--	--	--	--	1.20E-05	--	--	--	--	--	--
2-Nitroaniline	88-74-4	6.75E-08	1.38E-06	--	2.28E-07	--	--	9.12E-08	1.29E-07	1.50E-07	3.72E-06	--	3.71E-07	--	--	1.69E-07	2.76E-07
4-Nitroaniline	100-01-6	--	2.06E-05	--	--	--	--	2.47E-07	1.16E-06	--	6.00E-05	--	--	--	--	5.00E-07	3.42E-06
Benzo(a)anthracene	56-55-3	2.77E-07	9.21E-07	--	7.40E-08	3.64E-08	3.55E-08	--	1.78E-07	7.20E-07	2.16E-06	--	9.66E-08	6.42E-08	6.18E-08	--	4.80E-07
Benzo(a)pyrene	50-32-8	1.73E-07	3.91E-07	1.58E-08	7.91E-08	3.85E-08	4.10E-08	--	1.39E-07	4.26E-07	6.60E-07	4.02E-08	1.00E-07	7.44E-08	6.84E-08	--	3.24E-07
Benzo(b)fluoranthene	205-99-2	1.90E-07	3.68E-07	--	7.07E-08	4.69E-08	4.25E-08	--	1.59E-07	4.74E-07	7.20E-07	--	9.06E-08	9.60E-08	7.08E-08	--	3.96E-07
bis(2-Chloroethyl)ether	111-44-4	--	6.85E-08	--	--	--	--	--	--	--	1.26E-07	--	--	--	--	--	--
bis(2-Ethylhexyl)phthalate	117-81-7	--	--	--	--	--	--	--	3.02E-06	--	--	--	--	--	--	--	7.80E-06
Dibenzo(a,h)anthracene	53-70-3	5.11E-08	1.28E-07	--	1.27E-08	--	--	--	5.96E-08	1.80E-07	2.78E-07	--	1.89E-08	--	--	--	1.08E-07
Hexachlorobenzene	118-74-1	--	1.17E-07	--	--	--	--	--	--	--	2.70E-07	--	--	--	--	--	--
Naphthalene	91-20-3	--	1.10E-06	--	--	--	--	7.02E-07	1.26E-06	--	2.46E-06	--	--	--	--	1.76E-06	2.88E-06
Nitrobenzene	98-95-3	--	2.47E-07	--	--	--	--	3.98E-07	--	--	6.80E-07	--	--	--	--	8.70E-07	--
Pesticides (b)																	
4,4'-DDE	72-55-9	--	1.02E-06	--	--	--	--	--	--	--	1.98E-06	--	--	--	--	--	--
4,4'-DDT	50-29-3	--	1.23E-06	--	--	--	--	--	1.70E-07	--	3.48E-06	--	--	--	--	--	9.60E-07
Aldrin	309-00-2	8.74E-09	1.32E-07	--	--	1.14E-09	2.35E-09	--	3.63E-09	4.32E-08	2.70E-07	--	--	2.04E-09	4.07E-09	--	1.14E-08
alpha-BHC	319-84-6	--	3.59E-08	--	--	--	--	--	--	--	9.00E-08	--	--	--	--	--	--
beta-BHC	319-85-7	--	4.35E-07	--	--	--	--	2.09E-08	2.63E-07	--	1.26E-06	--	--	--	--	4.52E-08	1.56E-06
delta-BHC	319-86-8	5.50E-08	--	--	--	--	--	--	--	1.71E-07	--	--	--	--	--	--	--
Dieldrin	60-57-1	7.60E-08	1.17E-06	7.53E-09	2.07E-08	4.21E-09	7.96E-09	2.04E-08	6.80E-09	2.28E-07	3.00E-06	1.70E-08	3.50E-08	8.82E-09	3.02E-08	7.32E-08	2.28E-08
gamma-BHC (Lindane)	58-89-9	3.04E-08	--	--	--	--	--	--	7.64E-08	1.73E-07	--	--	--	--	--	--	4.50E-07
Heptachlor	76-44-8	4.72E-08	2.04E-07	--	--	--	--	1.12E-08	1.64E-08	1.67E-07	5.94E-07	--	--	--	--	2.67E-08	9.00E-08
Heptachlor Epoxide	1024-57-3	8.77E-09	7.50E-08	--	--	--	2.26E-09	--	--	2.82E-08	1.62E-07	--	--	--	6.18E-09	--	--
Herbicides (b)																	
MCPA	94-74-6	--	--	1.30E-06	--	--	--	--	--	--	3.16E-06	--	--	--	--	--	--

TABLE 5-11  
EXPOSURE POINT CONCENTRATIONS - EXCAVATION AIR - MODELED FROM COMBINED SOIL  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Constituent	CAS	EPC - MLE Scenario (mg/m3)								EPC - RME Scenario (mg/m3)							
		O	O North	P	Q North	Q Central	Q South	R	S	O	O North	P	Q North	Q Central	Q South	R	S
MCP	93-65-2	--	--	--	--	--	--	2.80E-06	--	--	--	--	--	--	--	3.71E-06	--
Pentachlorophenol	87-86-5	--	--	--	3.92E-06	9.76E-08	2.14E-06	--	6.88E-06	--	--	--	9.78E-06	3.91E-07	4.64E-06	--	2.64E-05
<b>PCBs (b)</b>																	
Total PCBs	1336-36-3	4.18E-06	1.07E-04	2.67E-07	1.76E-06	1.44E-07	3.39E-07	2.47E-06	1.05E-05	1.79E-05	1.82E-04	1.01E-06	3.24E-06	2.61E-07	1.14E-06	5.33E-06	6.05E-05
<b>Dioxin (b)</b>																	
2,3,7,8-TCDD-TEQ	1746-01-6	3.85E-10	1.95E-08	1.70E-11	3.14E-10	1.45E-10	1.29E-10	7.89E-11	2.80E-10	1.82E-09	2.98E-08	2.65E-11	6.66E-10	2.27E-10	2.71E-10	1.07E-10	1.55E-09
<b>Metals (b)</b>																	
Antimony	7440-36-0	--	--	--	4.66E-07	--	6.89E-07	--	--	--	--	--	9.96E-07	--	1.12E-06	--	--
Arsenic	7440-38-2	--	1.20E-06	7.75E-07	7.07E-07	8.83E-07	7.88E-07	3.67E-07	--	--	2.22E-06	1.01E-06	9.24E-07	1.33E-06	1.03E-06	4.39E-07	--
Barium	7440-39-3	--	--	--	8.26E-05	--	--	--	--	--	--	--	1.82E-04	--	--	--	--
Cadmium	7440-43-9	--	2.36E-06	6.40E-07	7.36E-07	--	--	--	--	--	5.16E-06	7.98E-07	1.13E-06	--	--	--	--
Chromium	7440-47-3	--	--	--	--	--	5.29E-06	--	1.08E-05	--	--	--	--	--	7.80E-06	--	2.88E-05
Copper	7440-50-8	--	--	--	--	1.37E-04	--	--	--	--	--	--	--	3.85E-04	--	--	--
Lead	7439-92-1	--	--	--	1.17E-04	--	--	4.97E-05	--	5.03E-05	--	--	1.18E-04	--	4.97E-05	--	5.03E-05
Manganese	7439-96-5	--	--	--	--	5.05E-05	4.21E-05	--	--	--	--	--	--	7.74E-05	5.12E-05	--	--
Mercury	7439-97-6	--	9.90E-06	--	--	--	1.55E-07	1.50E-05	--	--	2.16E-05	--	--	--	2.15E-07	4.19E-05	--
Nickel	7440-02-0	--	--	--	--	--	1.28E-05	--	--	--	--	--	--	--	2.59E-05	--	--

Notes

-- Not a constituent of potential concern in this location

CAS - Chemical Abstracts Service

EPC - Exposure point concentration

MCPA - 2-Methyl-4-chlorophenoxyacetic acid

MCP - 2-(2-Methyl-4-chlorophenoxy) propionic acid

MLE - Most Likely Exposure

PCBs - Polychlorinated Biphenyls

RME - Reasonable Maximum Exposure

SVOCs - Semivolatile Organic Compounds

TCDD-TEQ - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration

VOCs - Volatile Organic Compounds

(a) Excavation air concentrations for VOCs were modeled from combined soil EPCs (Table 5-9) using the RBCA Toolkit for Chemical Releases (Version 1.3a) (See Appendix L)

(b) Excavation air concentrations for non-VOCs are the combined soil EPC (mg/kg) (Table 5-9) multiplied by the PM10 (Particulate Matter of 10 microns in diameter) dust concentration (0.06 mg/m<sup>3</sup>) (MADEP, 1995) and multiplied by a unit correction factor (1E-6 kg/mg)

TABLE 5-12  
EXPOSURE POINT CONCENTRATIONS - SURFACE WATER  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Constituent	CAS	EPC - MLE Scenario (mg/L) (a)		EPC - RME Scenario (mg/L) (b)	
		Pond (Site Q)	River	Pond (Site Q)	River
<b>SVOCs</b>					
2,4-Dichlorophenol	120-83-2	-	6.01E-03	--	8.95E-03
4-Chloroaniline	106-47-8	-	1.22E-02	--	1.90E-02
<b>Herbicides</b>					
MCPA	94-74-6	--	3.10E-02	--	3.10E-02
MCPP	93-65-2	--	5.30E-02	--	5.30E-02
<b>Metals</b>					
Lead	7439-92-1	1.40E-02	--	1.40E-02	--
Manganese	7439-96-5	4.60E-01	--	4.60E-01	--

Notes

- Not a constituent of potential concern in this location

CAS - Chemical Abstracts Service  
EPC - Exposure point concentration  
MCPA - 2-Methyl-4-chlorophenoxyacetic acid  
MCPP - 2-(2-Methyl-4-chlorophenoxy) propionic acid  
MLE - Most Likely Exposure  
RME - Reasonable Maximum Exposure  
SVOCs - Semivolatile Organic Compounds  
(a) Average concentration  
(b) Lower of the 95% upper confidence limit and the maximum detected concentration  
Selection shown in Appendix I

TABLE 5-13  
 EXPOSURE POINT CONCENTRATIONS - SEDIMENT  
 HUMAN HEALTH RISK ASSESSMENT  
 SAUGET AREA 2 RI/FS  
 SAUGET, ILLINOIS

ENSR INTERNATIONAL

Constituent	CAS	EPC - MLE Scenario (mg/kg) (a)	EPC - RME Scenario (mg/kg) (b)
		River	River
<b>Metals</b>			
Arsenic	7440-38-2	2.90E+00	3.41E+00
Notes CAS - Chemical Abstracts Service EPC - Exposure point concentration MLE - Most Likely Exposure RME - Reasonable Maximum Exposure (a) Average concentration (b) Lower of the 95% upper confidence limit and the maximum detected concentration Selection shown in Appendix I			

TABLE 5-14  
EXPOSURE POINT CONCENTRATIONS - FISH FILLET  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

ENSR INTERNATIONAL

Constituent	CAS	EPC - MLE Scenario (mg/kg) (a)					EPC - RME Scenario (mg/kg) (b)				
		DDA	PDA	UDA	Pond (Site Q)	Pond (Site Q)	DDA	PDA	UDA	Pond (Site Q)	Pond (Site Q)
		Buffalo Fillet	Buffalo Fillet	Buffalo Fillet	Black Bullhead Fillet	Carp Fillet	Buffalo Fillet	Buffalo Fillet	Buffalo Fillet	Black Bullhead Fillet	Carp Fillet
<b>SVOCs</b>											
Benzo(a)anthracene	56-55-3	--	--	--	--	1 40E-01	--	--	--	--	1 40E-01
Benzo(a)pyrene	50-32-8	--	--	--	--	1 80E-01	--	--	--	--	1 80E-01
bis(2-Ethylhexyl)phthalate	117-81-7	--	--	--	--	5 00E-01	--	--	--	--	5 00E-01
Dibenzo(a,h)anthracene	53-70-3	--	--	--	--	1 40E-01	--	--	--	--	1 40E-01
<b>Pesticides</b>											
4,4'-DDE	72-55-9	--	--	1 70E-02	--	--	--	--	1 70E-02	--	--
4,4'-DDT	50-29-3	--	--	--	3 60E-01	3 30E-01	--	--	--	3 60E-01	3 30E-01
alpha-Chlordane	5103-71-9	--	--	--	1 00E-02	1 60E-02	--	--	--	1 00E-02	1 60E-02
beta-BHC	319-85-7	--	--	--	--	1 70E-02	--	--	--	--	1 70E-02
Dieldrin	60-57-1	--	--	8 10E-03	1 00E-01	1 90E-01	--	--	8 10E-03	1 00E-01	1 90E-01
<b>PCBs</b>											
Total PCBs	1336-36-3	--	--	--	3 87E+00	1 00E+01	--	--	--	3 87E+00	1 00E+01
<b>Dioxin</b>											
2,3,7,8-TCDD TEQ	1746-01-6	7 39E-07	5 25E-07	4 57E-06	3 84E-06	1 84E-05	7 39E-07	6 25E-07	4 57E-06	3 84E-06	1 84E-05
<b>Metals</b>											
Arsenic	7440-38-2	--	--	--	7 80E-01	8 20E-01	--	--	--	7 80E-01	8 20E-01
Mercury	7439-97-6	--	--	--	2 50E-01	7 10E-02	--	--	--	2 50E-01	7 10E-02
Notes											
Not a constituent of potential concern in this location											
CAS - Chemical Abstracts Service											
DDA - Downstream Discharge Area (Mississippi River)											
EPC - Exposure point concentration											
MLE - Most Likely Exposure											
PCBs - Polychlorinated Biphenyls											
PDA - Plume Discharge Area (Mississippi River)											
RME - Reasonable Maximum Exposure											
SVOCs - Semivolatile Organic Compounds											
TCDD-TEQ - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration											
UDA - Upstream Discharge Area (Mississippi River)											
(a) Average concentration											
(b) Maximum detected concentration											

TABLE 5-15  
EXPOSURE POINT CONCENTRATIONS - MID/SHALLOW GROUNDWATER AND LEACHATE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Constituent	CAS	EPC - MLE/RME Scenario (mg/L) (a)					
		Mid (b)		Shallow	Leachate		
		Q - AA-Q-6-24	R - AA-R-1-28	O - AA-O-1-16	L-O-1	L-Q-1	L-R-1
<b>VOCs</b>							
1,2-Dichloroethane	107-06-2	-	-	-	-	2.15E+00	5.00E+01
1,2-Dichloroethene (total)	540-59-0	-	-	-	-	-	1.30E+01
2-Butanone (MEK)	78-93-3	-	-	-	-	-	7.90E+00
4-Methyl-2-pentanone (MIBK)	108-10-1	-	-	-	2.10E-01	7.50E-01	-
Acetone	67-64-1	-	-	-	-	1.40E+00	3.20E+01
Benzene	71-43-2	4.75E-01	5.10E-01	-	9.20E-01	4.25E-01	6.80E+00
Chlorobenzene	108-90-7	-	2.00E+00	-	1.70E+00	1.15E+00	1.30E+00
Chloroform	67-66-3	-	-	-	-	-	2.00E+00
Chloromethane	74-87-3	-	3.20E-03	-	-	-	-
Dichloromethane	75-09-2	-	-	-	-	4.70E-02	1.90E+00
Tetrachloroethene	127-18-4	-	-	-	-	6.25E-02	3.30E+01
Toluene	108-88-3	-	-	-	-	-	2.10E+01
Trichloroethylene	79-01-6	-	-	-	-	2.00E-02	1.50E+02
<b>SVOCs</b>							
2,4,6-Trichlorophenol	88-06-2	-	-	-	3.80E-01	1.25E+01	-
2,4-Dichlorophenol	120-83-2	-	-	-	3.20E-01	1.70E+02	-
2,4-Dimethylphenol	105-67-9	-	-	-	-	2.40E-01	-
2-Chlorophenol	95-57-8	-	-	-	3.30E-01	7.90E+00	1.10E+01
2-Nitroaniline	88-74-4	-	-	-	2.60E-01	1.55E+01	-
3-Methylphenol/4-Methylphenol	106-44-5	-	-	-	6.40E-01	1.60E+00	4.50E+00
4-Chloroaniline	106-47-8	-	-	-	4.20E+00	9.30E+00	4.20E+01
4-Nitroaniline	100-01-6	-	-	-	7.00E-01	1.07E+00	1.80E+01
Benzo(a)pyrene	50-32-8	-	-	1.60E-03	-	-	-
Benzo(b)fluoranthene	205-99-2	-	-	1.10E-03	-	-	-
Benzo(g,h,i)perylene	191-24-2	-	-	-	-	-	1.40E+00
Benzo(k)fluoranthene	207-08-9	-	-	1.20E-03	-	-	-
Dibenzo(a,h)anthracene	53-70-3	-	-	2.70E-03	-	-	-
Indeno(1,2,3-cd)pyrene	193-39-5	-	-	3.00E-03	-	-	-
Naphthalene	91-20-3	-	-	-	5.70E-01	1.20E+00	-
Nitrobenzene	98-95-3	-	-	-	8.00E-02	1.30E+00	-
Phenol	108-95-2	-	-	-	3.80E+00	8.05E+00	1.10E+03
<b>Pesticides</b>							
4,4'-DDT	50-29-3	-	-	-	-	-	2.10E-01
gamma-BHC	319-85-7	-	-	-	2.50E-03	1.35E-02	2.00E-01
Diridrin	60-57-1	-	-	-	-	-	1.90E-01
Endrin Ketone	53494-70-5	-	-	-	-	3.20E-03	-
gamma-BHC (Lindane)	58-89-9	-	-	-	-	-	2.80E-02
Heptachlor	76-44-8	-	-	-	-	-	2.10E-01
<b>Herbicides</b>							
2,4,5-T	93-76-5	-	-	-	4.80E-01	-	-
2,4-D	94-75-7	-	-	-	9.30E-01	9.65E+01	3.80E+00
Pentachlorophenol	87-86-5	-	-	-	7.80E-01	4.80E+00	-
<b>PCBs</b>							
Total PCBs	1336-36-3	-	-	-	5.49E-02	1.04E-03	3.98E+00
<b>Dioxin</b>							
2,7,8-TCDD TEQ	1746-01-6	-	-	-	6.87E-07	-	3.14E-06

TABLE 5-15

EXPOSURE POINT CONCENTRATIONS - MID/SHALLOW GROUNDWATER AND LEACHATE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

ENSR INTERNATIONAL  
Page 2 of 2

Constituent	CAS	EPC - MLE/RME Scenario (mg/L) (a)					
		Mid (b)		Shallow	Leachate		
		Q - AA-Q-6-24	R - AA-R-1-28	O - AA-O-1-16	L-O-1	L-Q-1	L-R-1
<b>Metals</b>							
Antimony	7440-36-0	--	--	--	--	1.60E-02	--
Arsenic	7440-38-2	--	--	7.00E-02	--	--	--
Beryllium	7440-41-7	--	--	--	--	--	3.10E-02
Chromium	7440-47-3	--	--	--	--	--	6.00E-01
Cobalt	7440-48-4	--	--	--	--	--	2.60E+00
Lead	7439-92-1	--	--	1.90E-02	--	--	--
Manganese	7439-96-5	--	--	4.10E+00	1.80E+01	1.80E+00	2.50E+02
Mercury	7439-97-6	--	--	--	--	--	1.30E-02
Nickel	7440-02-0	--	--	--	--	3.10E-01	1.80E+00
Thallium	7440-28-0	--	--	--	3.70E-03	--	1.20E-01
Vanadium	7440-62-2	--	--	--	--	--	3.60E-01
Zinc	7440-66-6	--	--	--	--	7.45E+00	9.90E+01
Notes							
*-- Not a constituent of potential concern in this location							
CAS - Chemical Abstracts Service							
EPC - Exposure Point Concentration							
MLE - Most Likely Exposure							
PCBs - Polychlorinated Biphenyls							
RME - Reasonable Maximum Exposure							
SVOCs - Semivolatile Organic Compounds							
TCDD-TEQ - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration							
VOCs - Volatile Organic Compounds							
(a) EPCs for groundwater represent reported sample concentration. Therefore, RME and MLE EPCs are the same							
(b) EPCs in mid-groundwater are used to predict indoor and outdoor air EPCs for VOCs to be evaluated via the inhalation pathway. Receptors are not assumed to directly contact mid-groundwater.							

TABLE 5-16  
 EXPOSURE POINT CONCENTRATIONS - EXCAVATION TRENCH AIR VOCs -  
 MODELED FROM SHALLOW GROUNDWATER AND LEACHATE  
 HUMAN HEALTH RISK ASSESSMENT  
 SAUGET AREA 2 RI/FS  
 SAUGET, ILLINOIS

Constituent	CAS	EPC - MLE/RME Scenario (mg/m <sup>3</sup> ) (a) (b)			
		Shallow	Leachate		
		O - AA-O-1-16	L-O-1	L-Q-1	L-R-1
<b>VOCs</b>					
1,2-Dichloroethane	107-06-2	--	--	5.78E-02	1.35E+00
1,2-Dichloroethene (total)	540-59-0	--	--	--	3.86E-01
2-Butanone (MEK)	78-93-3	--	--	--	1.69E-01
4-Methyl-2-pentanone (MIBK)	108-10-1	--	4.51E-03	1.61E-02	--
Acetone	67-64-1	--	--	2.98E-02	6.81E-01
Benzene	71-43-2	--	2.49E-02	1.15E-02	1.84E-01
Chlorobenzene	108-90-7	--	4.24E-02	2.87E-02	3.25E-02
Chloroform	67-66-3	--	--	--	5.48E-02
Chloromethane	74-87-3	--	--	--	--
Dichloromethane	75-09-2	--	--	1.42E-03	5.76E-02
Tetrachloroethene	127-18-4	--	--	1.99E-03	7.95E-01
Toluene	108-88-3	--	--	--	5.22E-01
Trichloroethylene	79-01-6	--	--	5.16E-04	3.87E+00
<b>Notes</b>					
"--" Not a constituent of potential concern in this location					
CAS - Chemical Abstracts Service					
EPC - Exposure Point Concentration					
MLE - Most Likely Exposure					
RME - Reasonable Maximum Exposure					
VOCs - Volatile Organic Compounds					
(a) Modeled from shallow groundwater and leachate EPCs (Table 5-15) using the excavation trench model in Appendix K					
(b) EPCs for groundwater represent reported sample concentration. Therefore, RME and MLE EPCs are the same.					

TABLE 5-17  
EXPOSURE POINT CONCENTRATIONS - INDOOR AIR VOCs (a)  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Constituent	CAS	EPC - MLE/RME Scenario (mg/m <sup>3</sup> ) (b)					
		Mid		Shallow	Leachate		
		Q - AA-Q-6-24	R - AA-R-1-28	O - AA-O-1-16	L-Q-1	L-Q-1	L-R-1
<b>VOCs</b>							
1,2-Dichloroethane	107-06-2	--	--	--	--	7.37E-06	4.72E-07
1,2-Dichloroethene (total)	540-59-0	--	--	--	--	--	2.00E-06
2-Butanone (MEK)	78-93-3	--	--	--	--	--	2.70E-08
4-Methyl-2-pentanone (MIBK)	108-10-1	--	--	--	7.01E-07	8.28E-07	--
Acetone	67-64-1	--	--	--	--	4.65E-07	2.06E-08
Benzene	71-43-2	2.53E-05	2.51E-05	--	3.18E-05	3.66E-05	2.70E-06
Chlorobenzene	108-90-7	--	1.27E-05	--	1.62E-05	1.87E-05	1.58E-06
Chloroform	67-66-3	--	--	--	--	--	1.88E-06
Chloromethane	74-87-3	--	2.17E-04	--	--	--	--
Dichloromethane	75-09-2	--	--	--	--	1.75E-05	1.16E-06
Tetrachloroethene	127-18-4	--	--	--	--	9.29E-05	7.98E-06
Toluene	108-88-3	--	--	--	--	--	3.02E-06
Trichloroethylene	79-01-6	--	--	--	--	6.02E-05	4.82E-06
Notes "--" Not a constituent of potential concern in this location CAS - Chemical Abstracts Service EPC - Exposure Point Concentration MLE - Most Likely Exposure RME - Reasonable Maximum Exposure VOCs - Volatile Organic Compounds (a) Modeled from mid-groundwater and leachate EPCs (Table 5-15) using the USEPA Johnson and Ettinger Model, GW-ADV (USEPA 2000b, 2001b) (see Appendix J) (b) EPCs for groundwater represent sample concentrations. Therefore, RME and MLE EPCs are the same.							

TABLE 5-18  
 EXPOSURE POINT CONCENTRATIONS - OUTDOOR AIR VOCs -  
 MODELED FROM MID/SHALLOW GROUNDWATER AND LEACHATE (a)  
 HUMAN HEALTH RISK ASSESSMENT  
 SAUGET AREA 2 RI/FS  
 SAUGET, ILLINOIS

Constituent	CAS	EPC - MLE/RME Scenario (mg/m <sup>3</sup> ) (b)					
		Mid		Shallow	Leachate		
		Q - AA-Q-6-24	R - AA-R-1-28	O - AA-O-1-16	L-O-1	L-Q-1	L-R-1
<b>VOCs</b>							
1,2-Dichloroethane	107-06-2	--	--	--	--	1.0E-04	2.0E-03
1,2-Dichloroethene (total)	540-59-0	--	--	--	--	--	3.8E-03
2-Butanone (MEK)	78-93-3	--	--	--	--	--	7.3E-05
4-Methyl-2-pentanone (MIBK)	108-10-1	--	--	--	3.7E-05	4.9E-05	--
Acetone	67-64-1	--	--	--	--	9.6E-06	1.0E-04
Benzene	71-43-2	4.0E-05	1.8E-07	--	9.0E-05	3.9E-05	5.7E-04
Chlorobenzene	108-90-7	--	5.8E-07	--	1.2E-04	7.2E-05	7.3E-05
Chloroform	67-66-3	--	--	--	--	--	1.4E-04
Chloromethane	74-87-3	--	1.7E-08	--	--	--	--
Dichloromethane	75-09-2	--	--	--	--	3.2E-06	1.1E-04
Tetrachloroethene	127-18-4	--	--	--	--	1.5E-05	5.6E-03
Toluene	108-88-3	--	--	--	--	--	1.9E-03
Trichloroethylene	79-01-6	--	--	--	--	8.7E-06	5.1E-02
<b>Notes</b>							
"--" Not a constituent of potential concern in this location.							
CAS - Chemical Abstracts Service							
EPC - Exposure Point Concentration							
MLE - Most Likely Exposure.							
RME - Reasonable Maximum Exposure							
VOCs - Volatile Organic Compounds							
(a) Modeled from mid/shallow groundwater and leachate EPCs (Table 5-15) using the RBCA Tool Kit (version 1.3a) in Appendix L.							
(b) EPCs for groundwater represent reported sample concentration. Therefore, RME and MLE EPCs are the same.							

TABLE 5-19  
CALCULATION OF PARTICULATE EMISSION FACTOR - SITE O NORTH  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

ENSR INTERNATIONAL

Parameter	Definition	Units	Value	Source
Q/C	Inverse of mean concentration at center of source	g/m <sup>2</sup> -s per kg/m <sup>3</sup>	76.08	(a)
V	Fraction of vegetative cover	unitless	0.5	(b)
Um	Mean annual windspeed	m/s	4.69	(b)
Ut	Equivalent threshold value of windspeed at 7 m	m/s	11.32	(b)
F(x)	Function dependent on Um/Ut	unitless	0.194	(b)
PEF	Particulate emission factor	m <sup>3</sup> /kg	1.10E+09	(c)
Notes				
(a) USEPA, 1996a. Soil Screening Guidance: User's Guide. Exhibit 11 Value for Chicago, Illinois, 2 acre source area.				
(b) USEPA, 1996a. Soil Screening Guidance: User's Guide. Default value. Equation 5.				
(c) USEPA, 1996a. Soil Screening Guidance: User's Guide. Calculated using above parameters and Equation 5: $PEF (m^3/kg) = Q/C (g/m^2-s \text{ per } kg/m^3) \times \frac{3600s/h}{0.036 \times (1-V) \times (Um/Ut)^3 \times F(x)}$				

TABLE 5-20  
CALCULATION OF PARTICULATE EMISSION FACTOR - SITE S  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

ENSR INTERNATIONAL

Parameter	Definition	Units	Value	Source
Q/C	Inverse of mean concentration at center of source	g/m <sup>2</sup> -s per kg/m <sup>3</sup>	85.81	(a)
V	Fraction of vegetative cover	unitless	0.5	(b)
Um	Mean annual windspeed	m/s	4.69	(b)
Ut	Equivalent threshold value of windspeed at 7 m	m/s	11.32	(b)
F(x)	Function dependent on Um/Ut	unitless	0.194	(b)
PEF	Particulate emission factor	m <sup>3</sup> /kg	1.24E+09	(c)
Notes				
(a) USEPA 1996a Soil Screening Guidance User's Guide Exhibit 11 Value for Chicago Illinois, 1 acre source area				
(b) USEPA 1996a Soil Screening Guidance User's Guide Default value Equation 5				
(c) USEPA 1996a Soil Screening Guidance User's Guide Calculated using above parameters and Equation 5				
$PEF (m^3/kg) = Q/C (g/m^2-s \text{ per } kg/m^3) \times \frac{3600s/h}{0.036 \times (1-V) \times (Um/Ut)^3 \times F(x)}$				

TABLE 5-21  
 CALCULATION OF PARTICULATE EMISSION FACTOR - SITES O, P, Q NORTH, Q CENTRAL, Q SOUTH, R  
 HUMAN HEALTH RISK ASSESSMENT  
 SAUGET AREA 2 RI/FS  
 SAUGET, ILLINOIS

Parameter	Definition	Units	Value	Source
Q/C	Inverse of mean concentration at center of source	$\text{g/m}^2\text{-s per kg/m}^3$	50.60	(a)
V	Fraction of vegetative cover	unitless	0.5	(b)
U <sub>m</sub>	Mean annual windspeed	m/s	4.69	(b)
U <sub>t</sub>	Equivalent threshold value of windspeed at 7 m	m/s	11.32	(b)
F(x)	Function dependent on U <sub>m</sub> /U <sub>t</sub>	unitless	0.194	(b)
PEF	Particulate emission factor	$\text{m}^3/\text{kg}$	7.33E+08	(c)
Notes (a) USEPA, 1996a Soil Screening Guidance User's Guide Exhibit 11 Value for Chicago Illinois, 30 acre source area (b) USEPA 1996a Soil Screening Guidance User's Guide Default value Equation 5 (c) USEPA 1996a Soil Screening Guidance User's Guide Calculated using above parameters and Equation 5 $\text{PEF (m}^3/\text{kg)} = \text{Q/C (g/m}^2\text{-s per kg/m}^3) \times \frac{3600\text{s/h}}{0.036 \times (1-V) \times (U_m/U_t)^3 \times F(x)}$				

TABLE 5-22  
ABSORPTION ADJUSTMENT FACTORS (AAFs) FOR CHRONIC EXPOSURE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Constituent	Exposure Route (Medium) (unitless values)											
	(Water)		(Soil)		(Diet)		(Water)		(Soil)		Inhalation	
	Oral Carc.	Noncarc.	Oral Carc.	Noncarc.	Oral Carc.	Noncarc.	Dermal Carc.	Noncarc.	Dermal Carc.	Noncarc.	Carc.	Noncarc.
VOCs												
1,1,2-Trichloroethane	1	1	1	1	1	1	1	1	0.01	0.01	1	NA
1,2-Dichloroethane	1	1	1	1	1	1	1	1	0.01	0.01	1	1
1,2-Dichloroethene (total)	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	NA
2-Butanone (MEK)	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	1
4-Methyl-2-pentanone (MIBK)	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	1
Acetone	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	NA
Benzene	1	1	1	1	1	1	2.13	2.13	0.02	0.02	1	1
Chlorobenzene	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	1
Chloroform	NA	1	NA	1	NA	1	NA	1	NA	0.01	0.66	1
Chloromethane	1	NA	1	NA	1	NA	1	NA	0.01	NA	1	1
Dichloromethane	1	1	1	1	1	1	1.6	1.6	0.018	0.018	1	1
Ethylbenzene	NA	1	NA	1	NA	1	NA	1	NA	0.01	1	1
Tetrachloroethane	1	1	1	1	1	1	1	1	0.01	0.01	1	1
Toluene	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	1
Trichloroethylene	1	1	1	1	1	1	1	1	0.01	0.01	1	1
Xylenes Total	NA	1	NA	1	NA	1	NA	1.1	NA	0.011	NA	1
SVOCS												
1,2-Dichlorobenzene	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	1
1,3-Dichlorobenzene	NA	1 (a)	NA	1 (a)	NA	1 (a)	NA	1 (a)	NA	0.01 (a)	NA	1
1,4-Dichlorobenzene	1	1	1	1	1	1	1	1	0.01	0.01	1	1
2,4,6-Trichlorophenol	1	1	1	1	1	1	1	1	0.01	0.01	1	NA
2,4-Dichlorophenol	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	NA
2,4-Dimethylphenol	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	NA
2-Chlorophenol	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	NA
2-Methylnaphthalene	NA	1	NA	0.29	NA	1	NA	1	NA	0.1	NA	1
2-Nitroaniline	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1
3-Methylphenol/4-Methylphenol	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	NA
4-Chloroaniline	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	NA
4-Nitroaniline	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	1
Benzo(a)anthracene	1	NA	0.29	NA	1	NA	1	NA	0.02	NA	1	NA
Benzo(a)pyrene	1	NA	0.29	NA	1	NA	1	NA	0.02	NA	1	NA
Benzo(b)fluoranthene	1	NA	0.29	NA	1	NA	1	NA	0.02	NA	1	NA
Benzo(g,h,i)perylene	NA	1	NA	0.29	NA	1	NA	1	NA	0.1	NA	NA
Benzo(k)fluoranthene	1	NA	0.29	NA	1	NA	1	NA	0.02	NA	1	NA
bis(2-Chloroethyl)ether	1	NA	1	NA	1	NA	1	NA	0.01	NA	1	NA
bis(2-Ethylhexyl)phthalate	1	1	1	1	1	1	1	1	0.004	0.004	NA	NA
Dibenzo(a,h)anthracene	1	NA	0.29	NA	1	NA	1	NA	0.02	NA	1	NA
Hexachlorobenzene	1	1	0.83	0.83	1	1	1.1	1.1	0.04	0.04	1	NA
Indeno(1,2,3-cd)pyrene	1	NA	0.29	NA	1	NA	1	NA	0.02	NA	1	NA
Naphthalene	NA	1	NA	0.29	NA	1	NA	1	NA	0.1	NA	1
Nitrobenzene	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	1
Phenol	NA	1	NA	1	NA	1	NA	1	NA	0.01	NA	NA

TABLE 5-22  
ABSORPTION ADJUSTMENT FACTORS (AAFs) FOR CHRONIC EXPOSURE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Constituent	Exposure Route (Medium) (unitless values)									
	Oral (Water)		Oral (Soil)		Oral (Diet)		Dermal (Water)		Dermal (Soil)	
	Carc	Noncarc	Carc	Noncarc	Carc	Noncarc	Carc	Noncarc	Carc	Noncarc
<b>Pesticides</b>										
4,4'-DDE	1	1	1	1	1	1	1	1	0.01	0.01
4,4'-DDT	1	1	1	1	1	1	1	1	0.01	0.01
Aldrin	1	1	1	1	1	1	1	1	0.01	0.01
alpha-BHC	1	1	1	1	1	1	1	1	0.01	0.01
alpha-Chlordane	1	1	1	1	1	1	1	1	0.01	0.01
beta-BHC	1	1	1	1	1	1	1	1	0.01	0.01
delta-BHC	NA	1	NA	1	NA	1	NA	1	NA	0.01
Dieldrin	1	1	1	1	1	1	1	1	0.01	0.01
Endrin Ketone	NA	1	NA	1	NA	1	NA	1	NA	0.01
gamma-BHC (Lindane)	1	1	1	1	1	1	1	1	0.01	0.01
Heptachlor	1	1	1	1	1	1	1	1	0.01	0.01
Heptachlor epoxide	1	1	1	1	1	1	1	1	0.01	0.01
<b>Herbicides</b>										
2,4,5-T	NA	1	NA	1	NA	1	NA	1	NA	0.01
2,4-D	NA	1	NA	1	NA	1	NA	1	NA	0.01
MCPA	NA	1	NA	1	NA	1	NA	1	NA	0.01
MCPP	NA	1	NA	1	NA	1	NA	1	NA	0.01
Pentachlorophenol	1	1	1	1	1	1	1	1	0.01	0.01
<b>PCBs</b>										
Total PCBs	1	1	0.83	0.83	1	1	1.1	1.1	0.04	0.04
Dioxin										
2,3,7,8-TCDD-TEQ	1	NA	0.4	NA	1	NA	1.8	NA	0.04	NA
<b>Metals</b>										
Antimony	NA	1	NA	1	NA	1	NA	6.7	NA	0.007
Arsenic	1	1	0.3	0.3	1	1	1	1	0.001	0.001
Barium	NA	1	NA	1	NA	1	NA	1	NA	0.001
Beryllium	NA	1	NA	1	NA	1	NA	100	NA	0.1
Cadmium	NA	1	NA	1	NA	1	NA	40	NA	0.04
Chromium	NA	1	NA	0.3	NA	0.3	NA	40	NA	0.00
Cobalt	NA	1	NA	1	NA	1	NA	1	NA	0.01
Copper	NA	1	NA	1	NA	1	NA	1.67	NA	0.002
Lead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Manganese	NA	1	NA	1	NA	1	NA	10	NA	0.01
Mercury	NA	2	NA	2	NA	2	NA	13.7	NA	0.007
Nickel	NA	1	NA	1	NA	1	NA	77	NA	0.08
Thallium	NA	1	NA	1	NA	1	NA	1	NA	0.001
Vanadium	NA	1	NA	1	NA	1	NA	10	NA	0.01
Zinc	NA	1.6	NA	1	NA	1	NA	3.03	NA	0.003
Notes										
AAFs are either default values or derived by ENSR. See Appendix H.										
AAFs are only presented for constituents which have a corresponding dose response value.										
Carc: The value derived is for assessing the compound's carcinogenic potential.										
Default values are used where no chemical specific values available.										
Noncarc: The value derived is for assessing the compound's noncarcinogenic potential.										
(a) All values for 1,2-Dichlorobenzene used for 1,3-Dichlorobenzene.										

TABLE 5-23  
DERMAL PERMEABILITY CONSTANTS  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

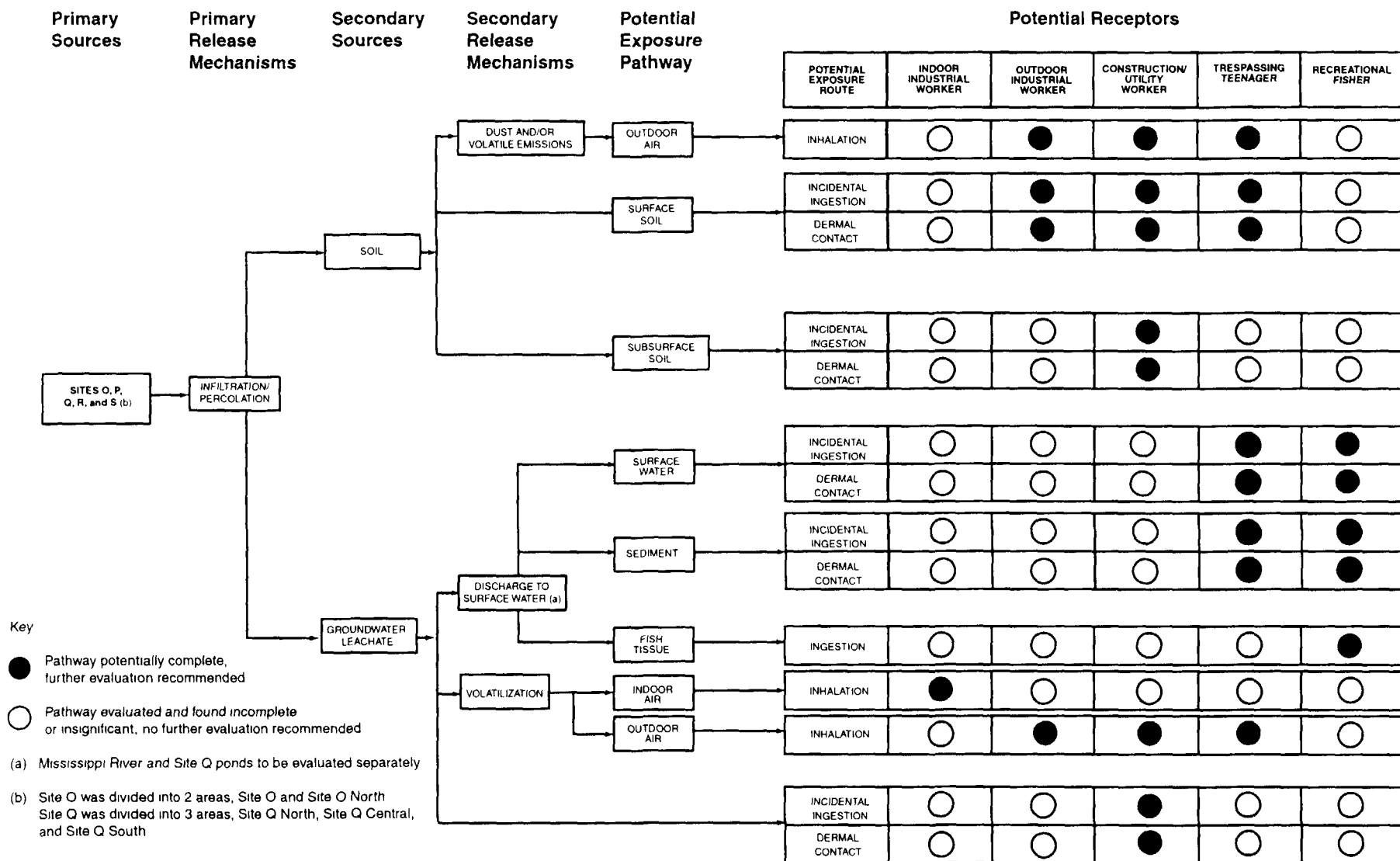
Constituent	Dermal Permeability Constant (cm/hr) (a)	
<b>VOCs</b>		
1,2-Dichloroethane	5 30E-03	
1,2-Dichloroethene (total)	1 00E-02	
2-Butanone (MEK)	1 10E-03	
4-Methyl-2-pentanone (MIBK)	2 77E-03	(b)
Acetone	5 69E-04	(b)
Benzene	2 10E-02	
Chlorobenzene	4 10E-02	
Chloroform	8 90E-03	
Chloromethane	4 20E-03	
Dichloromethane	4 50E-03	
Tetrachloroethene	4 80E-02	
Toluene	4 50E-02	
Trichloroethylene	1 60E-02	
<b>SVOCs</b>		
1,2-Dichlorobenzene	6 10E-02	
2,4,6-Trichlorophenol	5 00E-02	
2,4-Dichlorophenol	2 30E-02	
2,4-Dimethylphenol	1 50E-02	
2-Chlorophenol	1 10E-02	
2-Nitroaniline	5 45E-03	(b)
3-Methylphenol/4-Methylphenol	1 00E-02	(c)
4-Chloroaniline	6 33E-03	(b)
4-Nitroaniline	2 66E-03	(b)
Benzo(a)pyrene	1 20E+00	
Benzo(b)fluoranthene	1 20E+00	
Benzo(g,h,i)perylene	5 34E+00	(b)
Benzo(k)fluoranthene	1 20E+00	(d)
Dibenzo(a,h)anthracene	2 70E+00	
Indeno(1,2,3-cd)pyrene	1 90E+00	
Naphthalene	6 90E-02	
Nitrobenzene	6 96E-03	(b)
Phenol	5 50E-03	
<b>Pesticides</b>		
4,4'-DDT	4 30E-01	
beta-BHC	1 60E-02	(b)
Dieldrin	1 60E-02	
Endrin Ketone	1 60E-02	(e)
gamma-BHC (Lindane)	1 40E-02	
Heptachlor	1 10E-02	
<b>Herbicides</b>		
2,4,5-T	1 40E-04	(b)
2,4-D	8 45E-03	(b)
MCPA	2 31E-02	(b)
MCPP	1 56E-02	(b)
Pentachlorophenol	6 50E-01	
<b>PCBs</b>		
Total PCBs	7 10E-01	(f)
<b>Dioxin</b>		
2,3,7,8-TCDD-TEQ	1 40E+00	

**TABLE 5-23**  
**DERMAL PERMEABILITY CONSTANTS**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, ILLINOIS**

Constituent	Dermal Permeability Constant (cm/hr) (a)	
<b>Metals</b>		
Antimony	1.60E-04	(g)
Arsenic	1.60E-04	(g)
Beryllium	1.60E-04	(g)
Chromium	6.67E-04	(h)
Cobalt	4.00E-04	(i)
Lead	(j)	
Manganese	1.60E-04	(g)
Mercury	1.67E-03	(k)
Nickel	5.45E-05	(l)
Thallium	1.60E-04	(g)
Vanadium	1.60E-04	(g)
Zinc	6.00E-04	(m)
<b>Notes</b>		
(a) All values are from USEPA, 1992b, Dermal Exposure Assessment: Principles and Applications, Table 5-7, unless otherwise noted		
(b) See Table 5-24, calculated using logKow, molecular weight, and equation 5.8 from USEPA, 1992b		
(c) Average value of 3-Methylphenol and 4-methylphenol		
(d) Due to structural similarity, the value for benzo(b)fluoranthene is used to evaluate this constituent		
(e) Value for Endrin (USEPA, 1992b, Table 5-7)		
(f) Value for PCB hexachlorobiphenyl (USEPA, 1992b, Table 5-7)		
(g) Value for water (USEPA, 1992b, Table 5-7)		
(h) Average of values for Sodium chromate, Sodium dichromate and Chromium chloride (USEPA, 1992b, Table 5-3)		
(i) Value for Cobalt Chloride (USEPA, 1992b, Table 5-3)		
(j) Lead is evaluated using the adult lead model		
(k) Value for Mercuric Chloride (USEPA, 1992b, Table 5-3)		
(l) Average of values for nickel chloride and nickel sulfate (USEPA, 1992b, Table 5-3)		
(m) Value for zinc chloride (USEPA, 1992b, Table 5-3)		

TABLE 5-24  
DERMAL PERMEABILITY CONSTANTS - CALCULATED VALUES (a)  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Constituent	Molecular Weight		Log Kow		Log PC	Dermal Permeability Constant (cm/hr) (d)
2,4,5-T	255.48	(b)	0.6	(b)	-3.852428	1.40E-04
2,4-D	221.04	(b)	2.81	(b)	-2.073244	8.45E-03
2-Nitroaniline	138.13	(b)	1.83	(b)	-2.263293	5.45E-03
4-Chloroaniline	127.57	(b)	1.83	(b)	-2.198877	6.33E-03
4-Methyl-2-Pentanone (MIBK)	100.16	(b)	1.09	(b)	-2.557076	2.77E-03
4-Nitroaniline	138.13	(b)	1.39	(b)	-2.575693	2.66E-03
Acetone	58.08	(b)	-0.24	(b)	-3.244688	5.69E-04
Benzo(g,h,i)perylene	276.34	(b)	7.23	(b)	0.727626	5.34E+00
Beta-BHC	290.83	(b)	3.8	(b)	-1.796063	1.60E-02
MCPA	200.62	(c)	3.25	(c)	-1.636282	2.31E-02
MCPP	214.65	(c)	3.13	(c)	-1.807065	1.56E-02
Nitrobenzene	123.11	(b)	1.85	(b)	-2.157471	6.96E-03
Notes Kow - Octanol-Water Partition Coefficient PC - Permeability Constant (a) Values not presented in USEPA, 1992b (b) Handbook of RCRA Groundwater Monitoring Constituents: Physical and Chemical Properties, USEPA, September 1992d (c) PhysProp database internet source, <a href="http://esc.syrres.com/interkow/physdemo.htm">http://esc.syrres.com/interkow/physdemo.htm</a> (d) USEPA, 1992b, Dermal Exposure Equation 5.8: $\log K_p = -2.72 + 0.71 \log Kow - 0.0061 MW$						



M03071

**FIGURE 5-1**  
Conceptual Site Model  
Human Health Risk Assessment  
Sauget Area 2 RI/FS  
Sauget, Illinois



## 6.0 RISK CHARACTERIZATION

The potential risk to human health associated with potential exposure to COPCs in environmental media at the site is evaluated in this step of the risk assessment process. Risk characterization is the process in which the dose-response information (Section 4.0) is integrated with quantitative estimates of human exposure derived in the Exposure Assessment (Section 5.0). The result is a quantitative estimate of the likelihood that humans will experience any adverse health effects given the exposure assumptions made. Two general types of health risk are characterized for each potential exposure pathway considered: potential carcinogenic risk and potential noncarcinogenic hazard. Carcinogenic risk is evaluated by averaging exposure over a normal human lifetime, which, based on USEPA guidance (1989a), is assumed to be 70 years. Noncarcinogenic hazard is evaluated by averaging exposure over the total exposure period.

Characterization of the potential health effects of potential carcinogenic and noncarcinogenic constituents is approached in very different ways. The difference in approaches arises from the conservative assumption that substances with possible carcinogenic action proceed by a no-threshold mechanism, whereas other toxic actions may have a threshold, i.e., a dose below which few individuals would be expected to respond. Thus, under the no-threshold assumption, it is necessary to calculate a risk, but for constituents with a threshold, it is possible to simply characterize an exposure as above or below the threshold. In risk assessment, that threshold is termed a reference dose (RfD). Reference doses as well as cancer slope factors were discussed in Section 4.0. The approach to carcinogenic risk characterization is presented in Section 6.1, and the approach to noncarcinogenic risk characterization is presented in Section 6.2. The risk characterization results are presented in Section 6.3 by receptor, and in Section 6.4 by site. Uncertainties associated with the risk characterization are presented in Section 6.5. The risk calculation spreadsheets are presented in Appendix M.

### 6.1 Carcinogenic Risk Characterization Methods

The purpose of carcinogenic risk characterization is to estimate the upper-bound likelihood, over and above the background cancer rate, that a receptor will develop cancer in his or her lifetime as a result of exposure to a constituent in environmental media at the site. This likelihood is a function of the dose of a constituent (described in the Exposure Assessment, Section 5.0) and the Cancer Slope Factor (CSF) (described in the Toxicity Assessment, Section 4.0) for that constituent. The Excess Lifetime Cancer Risk (ELCR) is the likelihood over and above the background cancer rate, which currently in the US is approximately 1 in 3 (Jemal, et al., 2002), that an individual will contract cancer in his or her lifetime. The risk value is expressed as a probability (e.g.,  $10^{-4}$ , or one in ten thousand). The

relationship between the ELCR and the estimated Lifetime Average Daily Dose (LADD) of a constituent may be expressed as:

$$ELCR = 1 - e^{-(CSF \times LADD)}$$

When the product of the CSF and the LADD is much greater than 1, the ELCR approaches 1 (i.e., 100 percent probability). When the product is less than 0.01 (one chance in 100), the equation can be closely approximated by:

$$ELCR = LADD (mg/kg-day) \times CSF (mg/kg-day)^{-1}$$

The product of the CSF and the LADD is unitless, and provides an upper-bound estimate of the potential carcinogenic risk associated with a receptor's exposure to that constituent via that pathway.

The potential carcinogenic risk for each exposure pathway is calculated for each receptor. In current regulatory risk assessment, it is assumed that cancer risks are additive or cumulative. Pathway and area-specific risks are summed to estimate the total site potential cancer risk for each receptor. A summary of the total site cancer risks for each receptor group is presented in this section and compared to the USEPA's target risk range of  $10^{-4}$  to  $10^{-6}$ . Any COPC that causes an exceedance of the  $10^{-4}$  risk level for a particular receptor is designated a COC. The target risk levels used for the identification of COCs are based on USEPA guidance and Illinois TACO guidance, and were identified in the approved HHRA workplan. Specifically, USEPA provides the following guidance (USEPA, 1991a):

"Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than  $10^{-4}$ , and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts." and,

"The upper boundary of the risk range is not a discrete line at  $1 \times 10^{-4}$ , although EPA generally uses  $1 \times 10^{-4}$  in making risk management decisions. A specific risk estimate around  $10^{-4}$  may be considered acceptable if justified based on site-specific conditions."

IEPA provides the following summary for the evaluation of cumulative risk for carcinogens (IEPA, 2002b, Fact Sheet 13: Mixture Rule):

"The cumulative risk of carcinogenic contaminants attacking the same target must not exceed 1 in 10,000 [ $10^{-4}$ ]. Therefore, the risk from all on-site similar acting carcinogens must be added together. If this cumulative risk level is greater than 1 in 10,000, corrective action must be taken to reach an acceptable risk level."

Both RME and MLE results are considered in the identification of COCs. COCs are identified in Section 6.0.

## 6.2 Noncarcinogenic Risk Characterization Methods

The potential for exposure to a constituent to result in adverse noncarcinogenic health effects is estimated for each receptor by comparing the Chronic Average Daily Dose (CADD) for each COPC with the RfD for that COPC. The resulting ratio, which is unitless, is known as the Hazard Quotient (HQ) for that constituent. The HQ is calculated using the following equation:

$$HQ = \frac{CADD \text{ (mg/kg-day)}}{RfD \text{ (mg/kg-day)}}$$

The target HQ is defined as an HQ of less than or equal to one (USEPA, 1989a, 1991a). When the HQ is less than or equal to 1, the RfD has not been exceeded, and no adverse noncarcinogenic effects are expected. If the HQ is greater than 1, there may be a potential for adverse noncarcinogenic health effects to occur; however, the magnitude of the HQ cannot be directly equated to a probability or effect level.

The total Hazard Index (HI) is calculated for each exposure pathway by summing the HQs for each individual constituent. The total site HI is calculated for each potential receptor by summing the HIs for each pathway associated with the receptor. Where the total site HI is greater than 1 for any receptor, a more detailed evaluation of potential noncarcinogenic effects based on specific health or target endpoints (e.g., liver effects, neurotoxicity) is performed (USEPA, 1989a; IEPA, 2002b). The target HI is 1 on a per target endpoint basis.

A summary of all HIs for each receptor group is presented in this section and compared to the USEPA's target HI of 1. Each COPC that causes an exceedance of the HI of 1 for a particular receptor and for a particular target endpoint is designated a COC. Both RME and MLE results are considered in the identification of COCs.

## 6.3 Risk Characterization Results by Receptor

The results of the risk characterization are presented below by receptor. Tables 6-1 through 6-10 present the detailed per COPC HHRA results by receptor, location, medium, and pathway for the RME scenarios. Tables 6-11 through 6-20 provide the same for the MLE scenarios. Tables 6-21 through 6-24 provide the summarized results by receptor, location, medium, and pathway for the RME and MLE scenarios. Section 6.3 summarizes the results by receptor. Section 6.4 summarizes the results by site, receptor, and pathway, and identifies the COCs.

Site O and Site Q were divided into two and four areas, respectively. Therefore, soil and groundwater samples were divided accordingly. Appendix Table B-1 indicates which soil samples fall into each sub-area. For groundwater, location AA-O-1 falls within the boundaries of Site O, and is therefore combined with potential soil risks from Site O. Leachate location L-O-1 is located in Site O (North). Groundwater location AA-Q-6 is located in Site Q (South), and leachate location L-Q-1 is located in Site Q (North). Site R was evaluated as one area; therefore, both groundwater location AA-R-1 and leachate location L-R-1 fall within this area. Because the exposure assumptions for the receptors exposed to groundwater/leachate assume that the receptor receives a full daily dose from each area, having two groundwater/leachate locations in one area in effect double counts the receptor's potential risks from groundwater/leachate. To avoid this issue, the total tables for Site R present the potential risks from both locations, but uses the higher risk in the total.

### **6.3.1 Indoor Industrial Worker**

Potential carcinogenic risks for the RME scenario are presented in Table 6-1, and the potential HIs for the RME scenario are presented in Table 6-2. Risks and HIs for the MLE scenario are presented in Tables 6-11 and 6-12, respectively. The indoor industrial worker is assumed to be exposed to COPCs in groundwater via inhalation of constituents volatilized into indoor air.

As indicated in Table 6-1, the potential risks for the indoor industrial worker (RME) are within or below the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$  for all sites. Table 6-11 indicates that the potential risks for the MLE scenario are below the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$  for all sites.

Table 6-2 indicates that the potential HIs for the indoor industrial worker (RME) are below the target HI of 1 in each area. Table 6-12 indicates that the HIs for the indoor industrial worker in the MLE scenario are also below 1 in each area.

### **6.3.2 Outdoor Industrial Worker**

Potential carcinogenic risks for the RME scenario are presented in Table 6-3, and the potential HIs for the RME scenario are presented in Table 6-4. Risks and HIs for the MLE scenario are presented in Tables 6-13 and 6-14, respectively. The outdoor industrial worker is assumed to be exposed to COPCs in surface soil via incidental ingestion and dermal contact, to COPCs in combined soil via inhalation of volatiles and particulates in outdoor air, and to COPCs in groundwater via inhalation of constituents volatilized into outdoor air.

As indicated in Table 6-3, the potential risk for the outdoor industrial worker (RME) for all areas is within the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$  with the exception of Site O (North), Site R and Site S. Table 6-13 indicates that the potential risks for the MLE scenario for all areas are also within or

below the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$ , with the exception of Site O (North) and Site R, which exceed the range.

Table 6-4 indicates that the potential HIs for the outdoor industrial worker (RME) for four areas are below the target HI of 1. Site O, Site O (North), Site R and Site S have HIs above 1. The HIs for the outdoor industrial worker for the MLE scenario presented in Table 6-14 are below 1 for six areas and above 1 in Site O (North) and Site S.

### **6.3.3 Construction Worker**

Potential carcinogenic risks for the RME scenario are presented in Table 6-5, and the potential HIs for the RME scenario are presented in Table 6-6. Risks and HIs for the MLE scenario are presented in Tables 6-15 and 6-16, respectively. The construction worker is assumed to be exposed to COPCs in combined soil via incidental ingestion and dermal contact, inhalation of particulate matter in excavation dust, and inhalation of COPCs in combined soil that may volatilize to outdoor air. The construction worker is also assumed to be exposed to COPCs in groundwater or leachate in an excavation trench via incidental ingestion and dermal contact and inhalation of constituents volatilized into excavation air. Groundwater is evaluated as a direct contact medium for the construction worker only where it is present at less than 15 feet bgs.

As indicated in Table 6-5, the potential risk for the construction worker (RME) for all areas is below or within the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$ , with the exception of Site O (North) and Site R, which exceed the range. Table 6-15 indicates that the potential risks for the MLE scenario are also below or within the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$ , with the exception of Site R, which exceeds the range.

Table 6-6 indicates that the potential HIs for the construction worker (RME) are below the target HI of 1 in Site P, Site Q (Central), and Site Q (South), and above 1 in Site O, Site O (North), Site Q (North), Site R and Site S. The HI for the construction worker for the MLE scenario presented in Table 6-16 is below 1 for Site P, Site Q (Central), Site Q (South), and Site S, and above 1 in Site O, Site O (North), Site Q (North) and Site R.

The evaluation of potential exposure by the construction worker to lead identified as a COPC in shallow groundwater in Site O is presented in Appendix O. As the evaluation of lead is conducted using the arithmetic mean concentration, this evaluation applies to both the RME and MLE scenarios. The results indicate that the predicted blood lead level for this receptor (2.21 ug/dl) is below regulatory target levels (Appendix O).

#### **6.3.4 Trespassing Teen**

Potential carcinogenic risks for the RME scenario are presented in Table 6-7, and the potential HIs for the RME scenario are presented in Table 6-8. Risks and HIs for the MLE scenario are presented in Tables 6-17 and 6-18, respectively. The trespassing teen is assumed to be exposed to COPCs in surface soil via incidental ingestion, dermal contact, and inhalation of particulates, and to COPCs in combined soil via inhalation of volatiles, to COPCs in groundwater via inhalation of constituents volatilized into outdoor air, to COPCs in surface water via incidental ingestion and dermal contact, and to COPCs in sediment via incidental ingestion and dermal contact.

As indicated in Table 6-7, the potential risk for the trespassing teen (RME) is below or within the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$  with the exception of Site O (North), which was above the range. Table 6-17 indicates that the potential risks for the MLE scenario are below or within the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$ .

Table 6-8 indicates that the potential HI for the trespassing teen (RME) is below the target HI of 1 in each area except Site O (North) and Site S, where the HIs exceed 1. The HIs for the trespassing teen in the MLE scenario presented in Table 6-18 are below 1 for all areas with the exception of Site O (North).

The evaluation of potential exposure by the trespassing teen to lead identified as a COPC in Site Q Pond surface water is presented in Appendix O. As the evaluation of lead is conducted using the arithmetic mean concentration, this evaluation applies to both the RME and MLE scenarios. The results indicate that the predicted blood lead level for this receptor (2.23 ug/dl) is below regulatory target levels (Appendix O).

#### **6.3.5 Recreational Fisher**

Potential carcinogenic risks for the RME scenario are presented in Table 6-9, and the potential HIs for the RME scenario are presented in Table 6-10. Risks and HIs for the MLE scenario are presented in Tables 6-19 and 6-20, respectively. The recreational fisher is assumed to be exposed to COPCs in sediment via incidental ingestion and dermal contact, to COPCs in surface water via incidental ingestion and dermal contact, and to COPCs in consumed fish fillet.

No COPCs were identified in sediment in the Site Q Pond. COPCs were identified in surface water and fish fillet in both the Site Q Pond and the Mississippi River. Buffalo fish fillet data were available from the following areas of the Mississippi River: the PDA, the DDA, and the UDA, as described in Section 3.0. Excluding the upstream or reference sampling location (R-1), surface water and sediment data are available from 5 areas of the Mississippi River (locations R-2 through R-6).

Surface water and sediment risks for the recreational fisher were calculated for the river in total, not for individual areas within the river. Therefore, the total potential surface water and sediment risks were totaled with the potential risks associated with consumption of buffalo fish fillet in the PDA, DDA and UDA. In the Site Q Pond, two types of fish fillet were evaluated. Therefore, two separate risk estimates were calculated for the Site Q Pond, one for black bullhead fillet and one for carp fillet. The potential surface water risk was combined with the fillet risk in each case to derive the total potential risk for the recreational fisher.

As indicated in Table 6-9, the potential risk for the recreational fisher (RME) is within the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$  for all three areas of the Mississippi River. Potential risks in the Site Q Pond exceed the risk range for both carp fillet and black bullhead fillet. Table 6-19 indicates that the potential risks for the MLE scenario are below or within the USEPA target risk range of  $10^{-4}$  to  $10^{-6}$ .

Table 6-10 indicates that the potential HI for the recreational fisher (RME) is below the target HI of 1 for all three areas of the Mississippi River. Potential HIs in the Site Q Pond exceed the target HI for both carp fillet and black bullhead fillet. The HIs for the recreational fisher in the MLE scenario presented in Table 6-20 are below the target HI of 1 for all three areas of the Mississippi River. Potential MLE HIs in the Site Q Pond exceed the risk range for both carp fillet and black bullhead fillet.

The evaluation of potential exposure by the recreational fisher to lead identified as a COPC in Site Q Pond surface water is presented in Appendix O. As the evaluation of lead is conducted using the arithmetic mean concentration, this evaluation applies to both the RME and MLE scenarios. The results indicate that the predicted blood lead level for this receptor (2.23 ug/dl) is below regulatory target levels (Appendix O).

#### **6.4 Risk Characterization Results by Site**

Exceedances of USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and target HI of 1 are identified by site and receptor in the following sections. Where HI exceedances are identified, a target endpoint analysis was conducted, as presented in Appendix N. COPCs that significantly contribute to an exceedance of the  $10^{-4}$  risk level are identified as COCs. COPCs that significantly contribute to an exceedance of the target endpoint HI of 1 are also identified as COCs. Where COCs are identified, information regarding current site use is discussed for the receptors of interest.

##### **6.4.1 Site O**

As shown on Table 6-21, all potential risks calculated for both the RME and MLE receptor scenarios for Site O are within or below the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$ .

As shown on Table 6-23, there are exceedances of the target HI of 1 for several receptor scenarios. The target endpoint analyses are presented in Appendix N. A summary is provided below. For each

receptor, the total HI and COCs are identified (target endpoint, HQ, medium, pathway and EPC are identified for each COC):

- Outdoor Industrial Worker: RME (HI = 4.18)
  - COC: Xylenes (neurological effects, HQ = 3.23, combined soil, inhalation of VOCs, EPC = 14,000 mg/kg)
- Construction/Utility Worker: RME (HI = 21.4)
  - COC: Chlorobenzene (liver effects, HQ = 1.0, combined soil, inhalation of VOCs, EPC = 760 mg/kg)
  - COC: Xylenes (neurological effects, HQ = 14.2, combined soil, inhalation of VOCs, EPC = 14,000 mg/kg)
  - COC: Benzene (immune effects, HQ = 3.16, combined soil, inhalation of VOCs, EPC = 500 mg/kg)
  - COC: PCBs (immune, skin and eye effects, HQ = 2.53, combined soil, ingestion and dermal contact, EPC = 298 mg/kg)
- Construction/Utility Worker: MLE (1.27)
  - COCs: none identified based on target endpoint analysis.

Site O is located in an isolated area and is not currently used. As discussed in Section 2.3.1, the former ABRTF lagoons are covered and vegetated, and the vegetation is mowed periodically during the warmer months of the year. Therefore, the potential risks presented above for workers represent the future scenario (the only activity under the current scenario is mowing, which is limited in frequency and duration). The receptor assumptions are extremely conservative for this area, as it is unlikely that an outdoor industrial worker would access the site for 190 days per year. It is also unlikely that construction/utility work would occur in this area for the assumed 40 day period (RME) or 20 day period (MLE).

#### 6.4.2 Site O (North)

As shown in Tables 6-21 and 6-23, there are exceedances of the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and target hazard index of 1 for several Site O (North) receptor scenarios. The target endpoint analyses are presented in Appendix N. A summary is provided below. For each receptor the total risk or total HI is presented. COCs are identified for both potential carcinogenic and noncarcinogenic effects. For COCs identified based on potential carcinogenic effects, the risk level, medium, pathway and EPC are identified. For potential noncarcinogenic effects, the target endpoint, HQ, medium, pathway and EPC are identified for each COC.

- Outdoor Industrial Worker: RME (Risk = 6.28E-04)

- COC: Total PCBs (Risk =  $1.66E-04$ , surface soil, ingestion and dermal contact, EPC = 709 mg/kg)
- COC: Dioxin TEQ (Risk =  $4.59E-04$ , surface soil, ingestion and dermal contact, EPC = 0.0508 mg/kg)
- Outdoor Industrial Worker: RME (HI = 13.3)
  - COC: Xylenes (neurological effects, HQ = 1.23, combined soil, inhalation of VOCs, EPC = 3900 mg/kg)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 11.6, surface soil, ingestion and dermal contact, EPC = 709 mg/kg)
- Outdoor Industrial Worker: MLE (Risk =  $1.13E-04$ )
  - COC: Dioxin TEQ (Risk =  $8.32E-05$ , surface soil, ingestion and dermal contact, EPC = 0.0508 mg/kg)
- Outdoor Industrial Worker: MLE (HI = 8)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 7.27, surface soil, ingestion and dermal contact, EPC = 709 mg/kg)
- Construction/Utility Worker: RME (Risk =  $1.36E-04$ )
  - COC: Dioxin TEQ (Risk =  $1.15E-04$ , combined soil, ingestion and dermal contact, EPC = 0.0508 mg/kg)
- Construction/Utility Worker: RME (HI = 34.8)
  - COC: Xylenes (neurological effects, HQ = 3.95, combined soil, inhalation of VOCs, EPC = 3900 mg/kg)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 28.5, combined soil and leachate, ingestion and dermal contact, EPC (combined soil) = 3030 mg/kg), EPC (leachate) = 0.055 mg/L)
- Construction/Utility Worker: MLE (HI = 8.2)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 6.89, combined soil and leachate, ingestion and dermal contact, EPC (combined soil) = 1780 mg/kg), EPC (leachate) = 0.055 mg/L)
- Trespassing Teenager: RME (Risk =  $1.17E-04$ )
  - COC: Dioxin TEQ (Risk =  $8.62E-05$ , surface soil, ingestion and dermal contact, EPC = 0.0508 mg/kg)

- Trespassing Teenager: RME (HI = 4.97)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 4.86, surface soil, ingestion and dermal contact, EPC = 709 mg/kg)
- Trespassing Teenager: MLE (HI = 1.34)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 1.33, surface soil, ingestion and dermal contact, EPC = 709 mg/kg)

Site O (North) is located in an isolated area and is not currently used. As discussed in Section 2.3.1, the former ABRTF lagoons are covered and vegetated, and the vegetation is mowed periodically during the warmer months of the year. Therefore, the potential risks presented above for workers represent the future scenario (the only activity under the current scenario is mowing, which is limited in frequency and duration).. The receptor assumptions are extremely conservative for this area, as it is unlikely that an outdoor industrial worker would access the site for 190 days per year. It is also unlikely that construction/utility work would occur in this area for the assumed 40 day period (RME) or 20 day period (MLE). Due to the isolated nature of the site, it is unlikely that trespassers would enter the site as frequently as assumed (26 days RME, 13 days MLE).

#### **6.4.3 Site P**

As shown on Tables 6-21 and 6-23, all potential risks and HIs calculated for both the RME and MLE receptor scenarios for Site P are within or below the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and below the target HI of 1.

#### **6.4.4 Site Q (North)**

As shown on Table 6-21, all potential risks calculated for both the RME and MLE receptor scenarios for Site Q (North) are within or below the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$ .

As shown in Table 6-23, there are exceedances of the USEPA's target hazard index of 1 for two Site Q (North) receptor scenarios. The target endpoint analyses are presented in Appendix N. A summary is provided below. For each receptor the total HI is presented. COCs are identified for potential noncarcinogenic effects. For each COC, the target endpoint, HQ, medium, pathway and EPC are identified.

- Construction/Utility Worker: RME (HI = 11.7)
  - COC: 2,4,6-Trichlorophenol (reproductive effects, HQ = 8.43, leachate, ingestion and dermal contact, EPC = 12.5 mg/L)
  - COC: 2,4-Dichlorophenol (immune effects, HQ = 1.82, leachate, ingestion and dermal contact, EPC = 170 mg/L)

- Construction/Utility Worker: MLE (HI = 5.55)
  - COC: 2,4,6-Trichlorophenol (reproductive effects, HQ = 4.21, leachate, ingestion and dermal contact, EPC = 12.5 mg/L)
  - COC: 2,4-Dichlorophenol (immune effects, HQ = 0.907, leachate, ingestion and dermal contact, EPC = 170 mg/L)

A 10-acre site on Site Q (North) is currently used by Rivercity Landscape Supply as a bulk storage terminal for lawn and garden products. Raw landscape products such as mulch, rock and soil are processed and packed on this portion of the site. Access to some portions of the site is restricted by fencing and gates. Other parts of the site have unrestricted access. As noted above, potential risk exceedances for this area were identified for the construction/utility worker, not for the outdoor industrial worker. Therefore, these are potential risks for a future construction/utility worker, as there is no current excavation work in this area.

#### **6.4.5 Site Q (Central)**

As shown on Tables 6-21 and 6-23, all potential risks and HIs calculated for both the RME and MLE receptor scenarios for Site Q (Central) are within or below the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and below the target HI of 1.

#### **6.4.6 Site Q (South)**

As shown on Tables 6-21 and 6-23, all potential risks and HIs calculated for both the RME and MLE receptor scenarios for Site Q (South) are within or below the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and below the target HI of 1.

#### **6.4.7 Site Q Pond**

As shown in Tables 6-21 and 6-23, there are exceedances of the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and target hazard index of 1 for several Site Q Pond receptor scenarios, due to the assumed ingestion of fish scenario. The target endpoint analyses are presented in Appendix N. A summary is provided below. For each receptor the total risk or total HI is presented. COCs are identified for both potential carcinogenic and noncarcinogenic effects. For COCs identified based on potential carcinogenic effects, the risk level, medium, pathway and EPC are identified. For potential noncarcinogenic effects, the target endpoint, HQ, medium, pathway and EPC are identified for each COC.

- Recreational Fisher - black bullhead fillet: RME (Risk = 5.49E-04)
  - COC: Total PCBs (Risk = 3.79E-04, black bullhead fillet, ingestion, EPC = 3.87 mg/kg)
  - COC: Dieldrin (Risk = 7.84E-05, black bullhead fillet, ingestion, EPC = 0.1 mg/kg)

- Recreational Fisher - black bullhead fillet: RME (HI = 22.9)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 22.1, black bullhead fillet, ingestion, EPC = 3.87 mg/kg)
- Recreational Fisher - black bullhead fillet: MLE (HI = 2.86)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 2.76, black bullhead fillet, ingestion, EPC = 3.87 mg/kg)
- Recreational Fisher - carp fillet: RME (Risk = 1.45E-03)
  - COC: Total PCBs (Risk = 9.8E-04, carp fillet, ingestion, EPC = 10 mg/kg)
  - COC: Dieldrin (Risk = 1.49E-04, carp fillet, ingestion, EPC = 0.19 mg/kg)
  - COC: Dioxin TEQ (Risk = 1.35E-04, carp fillet, ingestion, EPC = 1.84E-05 mg/kg)
  - COC: Benzo(a)pyrene (Risk = 6.44E-05, carp fillet, ingestion, EPC = 0.18 mg/kg)
  - COC: Arsenic (Risk = 6.02E-05, carp fillet, ingestion, EPC = 0.82 mg/kg)
- Recreational Fisher - carp fillet: RME (HI = 58)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 57.1, carp fillet, ingestion, EPC = 10 mg/kg)
- Recreational Fisher - carp fillet: MLE (HI = 7.25)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 7.14, carp fillet, ingestion, EPC = 10 mg/kg)

Fishing can occur in the Site Q Ponds; however, as noted in Section 2.3.3, fish are only present as a result of flood events. After the ponds dry out, fish are not reintroduced until another flood event, although water may collect in the ponds from precipitation. It is therefore extremely unlikely that a recreational fisher would be able to obtain 22 fish meals per year from the Site Q Ponds, as assumed by the RME scenario.

#### **6.4.8 Site R**

As shown in Tables 6-21 and 6-23, there are exceedances of the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and target hazard index of 1 for several Site R receptor scenarios. The target endpoint analyses are presented in Appendix N. A summary is provided below. For each receptor the total risk or total HI is presented. COCs are identified for both potential carcinogenic and noncarcinogenic effects. For COCs identified based on potential carcinogenic effects, the risk level, medium, pathway and EPC are identified. For potential noncarcinogenic effects, the target endpoint, HQ, medium, pathway and EPC are identified for each COC.

- Outdoor Industrial Worker: RME (Risk = 1.32E-03)
  - COC: Trichloroethylene (Risk = 1.31E-03, combined soil and leachate, inhalation of volatiles, EPC combined soil = 2200 mg/kg, EPC leachate = 150 mg/L)
- Outdoor Industrial Worker: RME (HI = 1.11)
  - COCs: none identified based on target endpoint analysis.
- Outdoor Industrial Worker: MLE (Risk = 1.36E-04)
  - COC: Trichloroethylene (Risk = 1.34E-04, leachate, inhalation of volatiles, EPC leachate = 150 mg/L)
- Construction/Utility Worker: RME (Risk = 9.79E-04)
  - COC: Trichloroethylene (Risk = 7.56E-04, combined soil and leachate, ingestion, dermal contact and inhalation, EPC combined soil = 2200 mg/kg, EPC leachate = 150 mg/L)
  - COC: Total PCBs (Risk = 1.17E-04, leachate, ingestion and dermal contact, EPC = 3.98 mg/L)
  - COC: 1,2-Dichloroethane (Risk = 5.54E-05, leachate, inhalation of volatiles, EPC = 50 mg/L)
- Construction/Utility Worker: RME (HI = 232)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 204, leachate, ingestion and dermal contact, EPC = 3.98 mg/L)
  - COC: Trichloroethylene (liver effects, HQ = 12.7, combined soil and leachate, ingestion and dermal contact; neurological effects, HQ = 3.75, combined soil and leachate, inhalation of volatiles; EPC combined soil = 2200 mg/kg, EPC leachate = 150 mg/L)
  - COC: 1,2-Dichloroethane (liver, kidney, GI and skin effects, HQ = 8.42, leachate, inhalation of volatiles, EPC leachate = 50 mg/L)
  - COC: Mercury (immune effects, HQ = 0.747, combined soil, ingestion and dermal contact, EPC = 699 mg/kg)
- Construction/Utility Worker: MLE (Risk = 3.17E-04)
  - COC: Trichloroethylene (Risk = 2.19E-04, leachate, inhalation of volatiles, EPC leachate = 150 mg/L)
- Construction/Utility Worker: MLE (HI = 112)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 102, leachate, ingestion and dermal contact, EPC = 3.98 mg/L)

- COC: Trichloroethylene (liver effects, HQ = 5.76, leachate, ingestion and dermal contact; EPC leachate = 150 mg/L)
- COC: 1,2-Dichloroethane (liver, kidney, GI and skin effects, HQ = 2.53, leachate, inhalation of volatiles, EPC leachate = 50 mg/L)

Site R is a closed industrial-waste disposal area owned by Solutia, Inc. The site is not currently used. Access to Site R is restricted by fencing and is monitored by Solutia plant personnel. Therefore, the potential risks presented above represent the future scenario. It is unlikely that an outdoor industrial worker will access the site 190 days per year in the future. Excavation is not allowed at Site R unless a permit is obtained from the plant and appropriate measures are taken to protect workers undertaking intrusive activities. Therefore, the risk assessment for the construction/utility worker represents a very conservative scenario.

#### **6.4.9 Site S**

As shown in Tables 6-21 and 6-23, there are exceedances of the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and target hazard index of 1 for several Site S receptor scenarios. The target endpoint analyses are presented in Appendix N. A summary is provided below. For each receptor the total risk or total HI is presented. COCs are identified for both potential carcinogenic and noncarcinogenic effects. For COCs identified based on potential carcinogenic effects, the risk level, medium, pathway and EPC are identified. For potential noncarcinogenic effects, the target endpoint, HQ, medium, pathway and EPC are identified for each COC.

- Outdoor Industrial Worker: RME (Risk = 3.24E-04)
  - COC: Total PCBs (Risk = 2.37E-04, surface soil, ingestion and dermal contact, EPC = 1010 mg/kg)
- Outdoor Industrial Worker: RME (HI = 16.9)
  - COCs: Total PCBs (immune, skin and eye effects, HQ = 16.6, surface soil, ingestion and dermal contact, EPC = 1010 mg/kg)
- Outdoor Industrial Worker: MLE (HI = 5.23)
  - COCs: Total PCBs (immune, skin and eye effects, HQ = 5.17, surface soil, ingestion and dermal contact, EPC = 504 mg/kg)
- Construction/Utility Worker: RME (HI = 9.19)
  - COCs: Total PCBs (immune, skin and eye effects, HQ = 8.56, combined soil, ingestion and dermal contact, EPC = 1010 mg/kg)

- Trespasser: RME (HI = 6.96)
  - COCs: Total PCBs (immune, skin and eye effects, HQ = 6.91, surface soil, ingestion and dermal contact, EPC = 1010 mg/kg)

The 1-acre site is currently not used. The northern portion of the site is grassed, and its southern portion is covered with gravel and fenced. Therefore, the potential risks presented above for workers represent the future scenario only, and the exposure frequency assumptions are very conservative given the small size of the site. Additionally, due to the fencing of portions of the site and the small size, trespassers are unlikely to access the site frequently.

#### **6.4.10 Mississippi River**

As shown on Tables 6-22 and 6-24, all potential risks and HIs calculated for both the RME and MLE receptor scenarios for the Mississippi River recreational fisher and trespassing teenage scenarios are within or below the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and below the target HI of 1.

#### **6.4.11 COC Summary**

The COCs identified above are summarized in Table 6-25 and in Figure 6-1.

### **6.5 Uncertainty Analysis**

Within any of the four steps of the human health risk assessment process, assumptions must be made due to a lack of absolute scientific knowledge. Some of the assumptions are supported by considerable scientific evidence, while others have less support. Every assumption introduces some degree of uncertainty into the risk assessment process. Regulatory risk assessment methodology requires that conservative assumptions be made throughout the risk assessment to ensure that public health is protected. Therefore, when all of the assumptions are combined, it is much more likely that risks are overestimated rather than underestimated.

The assumptions that introduce the greatest amount of uncertainty in this risk assessment are discussed in this section. They are discussed in qualitative terms, because for most of the assumptions there is not enough information to assign a numerical value to the uncertainty that can be factored into the calculation of risk.

#### **6.5.1 Selection of Constituents of Potential Concern**

In the Hazard Identification step, information on constituents detected at the site is combined with criteria quantifying their potential toxicity to obtain a subset of constituents for quantitative evaluation in the risk assessment, the COPCs. The goal is to include in the quantitative portion of the risk

assessment those constituents that are the most toxic, prevalent, environmentally-persistent, and mobile. The selection of the COPCs forms the basis of the quantitative risk assessment.

Generally in the site characterization phase of the site assessment, knowledge of past and current land use is used to determine which analytical parameters are analyzed and what analytical methods are employed for the detection of constituents in the relevant environmental media at the site. However, for Sauget Area 2, the knowledge of past and current industrial practices was not used to limit the analyte list. Instead, the majority of environmental samples were analyzed for a full suite of constituents including VOCs, SVOCs, metals, cyanide, PCBs, pesticides, herbicides, dioxins and furans, as detailed in Section 3.1.2.

In the Hazard Identification process, it is assumed that only those constituents detected are actually present at the site. However, it is possible that constituents not on the analyte list may be present at the site. Should this be the case, site risks may be underestimated depending on the nature of the constituents not included in the sample analyses. However, the full suite of USEPA analyte lists were used and are as inclusive as possible of constituents used in industry that are of potential public health concern. Therefore, it is unlikely that constituents not included on the analyte list would be present at the site at concentrations that would pose a risk to public health.

A subset of constituents detected at a site is generally selected for quantitative analysis for several reasons. Some constituents detected at a site may be naturally occurring and not related to site use. Other constituents may be present at concentrations that can be assumed with reasonable assurance not to pose a risk to human health. A review of the results of risk assessments demonstrate that in most cases risks are attributable only to one or a few constituents, and that many of the constituents quantitatively evaluated do not contribute significantly to total risk estimates (USEPA, 1993a). The screening process is conducted to identify the COPCs that may contribute the greatest to potential risk. The screening process used here is conservative. Although the excluded constituents may pose a finite level of risk, that risk would contribute negligibly to the total site risk. Therefore, not evaluating the excluded constituents will not measurably affect the numerical estimates of hazard or risk, and thus not affect remedial decision-making at the site.

#### **6.5.1.1 COPCs for Groundwater Based on IEPA Groundwater Standards**

COPCs for groundwater were selected using drinking water criteria, even though groundwater in the area is prohibited by ordinances from the Villages of Sauget and Cahokia (see Appendix P). Therefore, the selection of COPCs for groundwater was very conservative.

#### **6.5.1.2 COPCs for Air**

Air samples were collected in the vicinity of Sites P, Q, and R and analyzed for VOCs, SVOCs, PCBs, dioxins, and metals. Air samples were collected over a 24-hour period during hot, dry conditions (August, 2002) conducive to air emissions of dust and volatiles. These data are compared to chronic screening levels as discussed in the HHRA Workplan (Appendix A). However, due to the one-time sample collection, these data are not quantitatively evaluated in the HHRA. As noted in the HHRA Workplan, the air pathway is addressed in the HHRA by modeling potential sources in soil, waste and groundwater (see Section 5.0). Appendix G presents the relatively few COPCs identified for the air samples. Benzene was identified as a COPC in every air sample. The screening level for benzene in air is very low (the Region 9 PRG is 0.23 ug/m<sup>3</sup>). The site sample results range from 0.37 ug/m<sup>3</sup> to 7.8 ug/m<sup>3</sup>. These results are consistent with average outdoor air levels of benzene across the US of 9.1 ug/m<sup>3</sup> (Shah and Singh, 1988).

#### **6.5.2 Toxicity Assessment**

The purpose of the toxicity assessment is to identify the types of adverse health effects a constituent may potentially cause and to define the relationship between the dose of a constituent and the likelihood or magnitude of an adverse effect (response). Risk assessment methodologies typically divide potential health effects of concern into two general categories: effects with a threshold (noncarcinogenic) and effects assumed to be without a threshold (potentially carcinogenic). Toxicity assessments for both of these types of effects share many of the same sources of uncertainty. To compensate for these uncertainties, USEPA has developed RfDs and CSFs that are biased to overestimate rather than under-estimate human health risks. Several of the more important sources of uncertainty and the resulting biases are discussed below.

##### **6.5.2.1 Animal-to-Human Extrapolation in Noncarcinogenic Dose-Response Evaluation**

For many constituents, animal studies provide the only reliable information on which to base an estimate of adverse human health effects. Extrapolation from animals to humans introduces a great deal of uncertainty into the risk characterization. In most instances, it is not known how differently a human may react to the constituent compared to the animal species used to test the constituent. If a constituent's fate and the mechanisms by which it causes adverse effects are known in both animals and humans, uncertainty is reduced. When the fate and mechanism for the constituent are unknown, uncertainty increases.

The procedures used to extrapolate from animals to humans involve conservative assumptions and incorporate uncertainty factors such that overestimation of effects in humans is more likely than underestimation. When data are available from several species, the lowest dose that elicits effects in

the most sensitive species is used for the calculation of the RfD. To this dose are applied uncertainty factors, generally of 1 to 10 each, to account for intraspecies variability, interspecies variability, study duration, and/or extrapolation of a low effect level to a no effect level. Thus, most reference doses used in risk assessment are 100- to 10,000-fold lower than the lowest effect level found in laboratory animals.

Nevertheless, because the fate of a constituent can differ in animals and humans, it is possible that animal experiments will not reveal an adverse effect that would manifest itself in humans. This can result in an underestimation of the effects in humans. The opposite may also be true: effects observed in animals may not be observed in humans, resulting in an overestimation of potential adverse human health effects.

#### **6.5.2.2 Evaluation of Carcinogenic Dose-Response**

Significant uncertainties exist in estimating dose-response relationships for potential carcinogens. These are due to experimental and epidemiologic variability, as well as uncertainty in extrapolating both from animals to humans and from high to low doses. Three major issues affect the validity of toxicity assessments used to estimate potential excess lifetime cancer risks: (1) the selection of a study (i.e., data set, animal species, matrix the constituent is administered in) upon which to base the calculations, (2) the conversion of the animal dose used to an equivalent human dose, and (3) the mathematical model used to extrapolate from experimental observations at high doses to the very low doses potentially encountered at the site.

##### Study Selection

Study selection involves the identification of a data set (experimental species and specific study) that provides sufficient, well-documented dose-response information to enable the derivation of a valid CSF. Human data (e.g., from epidemiological studies) are preferable to animal data, although adequate human data sets are relatively uncommon. Therefore, it is often necessary to seek dose-response information from a laboratory species, ideally one that biologically resembles humans (e.g., with respect to metabolism, physiology, and pharmacokinetics), and where the route of administration is similar to the expected mode of human exposure (e.g., inhalation and ingestion). When multiple valid studies are available, the USEPA generally bases CSFs on the one study and site that show the most significant increase in tumor incidence with increasing dose. In some cases this selection is done in spite of significant decreases with increasing dose of tumor incidence in other organs and total tumor incidence. Consequently, the current study selection criteria are likely to lead to overestimation of potential cancer risks in humans.

#### Interspecies Dose Conversion

The USEPA derivation of human equivalent doses by conversion of doses administered to experimental animals requires the assumption that humans and animals are equally sensitive to the toxic effects of a substance, if the same dose per unit body surface area is absorbed by each species. Although such an assumption may hold for direct-acting genotoxicants, it is not necessarily applicable to many indirect acting carcinogens and likely overestimates potential risk by a factor of 6 to 12 depending on the study species (USEPA, 1992e). Further assumptions for dose conversions involve standardized scaling factors to account for differences between humans and experimental animals with respect to life span, body size, breathing rates, and other physiological parameters. In addition, evaluation of risks associated with one route of administration (e.g., inhalation) when tests in animals involve a different route (e.g., ingestion) requires additional assumptions with corresponding additional uncertainties. Although USEPA has formally changed its default position for scaling animal data to humans from a per surface area to a per body weight basis (USEPA, 1992e), changes to existing CSF will only be made when the USEPA commits to a formal review of a constituent's dose-response profile, and as of this writing, few have been incorporated.

#### High-to-Low Dose Extrapolation

The concentration of constituents to which people are potentially exposed at industrial sites is usually much lower than the levels used in the studies from which dose-response relationships are developed. Estimating potential health effects at such sites, therefore, requires the use of models that allow extrapolation of health effects from high experimental doses in animals to low environmental doses. These models are generally statistical in character and have little or no biological basis. Thus the use of a model for dose extrapolation introduces uncertainty in the dose-response estimate. In addition, these models contain assumptions that may also introduce a large amount of uncertainty. Generally the models have been developed to err on the side of over-estimating rather than under-estimating potential health risks.

Although USEPA has published draft guidance that allows consideration of other dose extrapolation models (USEPA, 2003d), the majority of USEPA CSFs are derived using the upper 95% confidence limit of the slope predicted by the linearized multi-stage (LMS) model used to extrapolate low dose risk from high dose experimental data. USEPA recognizes that this method produces very conservative risk estimates, however, LMS remains as the default model for linear extrapolation. USEPA states that the upper-bound estimate generated by the LMS model leads to a plausible upper limit to the risk that is consistent with some of the proposed mechanisms of carcinogenesis. The true risk, however, is unknown and may be as low as zero. The LMS model is very conservative as it assumes strict linearity between the lowest dose that produced an effect and zero dose. However, the body has many mechanisms to detoxify constituents, especially at low doses, and many mechanisms to repair damages if they should occur. Therefore, many scientists believe that most constituents can cause cancer only above a "threshold" dose. This phenomenon of a threshold for carcinogenic activity has recently been demonstrated for chloroform (as reviewed in Bradley, 1996).

An established policy does not yet exist for using "most likely" or "best" estimates of risk within the range of uncertainty defined by the upper- and lower-limit estimates defined by the models. USEPA has published a draft version of its cancer guidelines (USEPA, 2003d). These draft guidelines allow for much greater use of mechanistic data, however, the guidelines have not yet been finalized and it will take time before USEPA can apply the new methodology to existing CSFs.

### **6.5.3 Exposure Assessment**

Exposure assessment consists of three basic steps: 1) development of exposure scenarios, (2) estimation of exposure point concentrations, and 3) estimation of human dose.

#### Exposure Scenarios

Exposure scenarios in a risk assessment are selected to be representative of potential exposures to COPCs in media that may be experienced by human receptors based on current and reasonably foreseeable land use. These exposure scenarios are developed for a hypothetical receptor, but one that would represent the RME scenario for the site. Therefore, exposure levels are assumed for these receptors, i.e., commercial/industrial, recreational, that are much greater than expected to occur in an actual population. The use of the MLE scenarios provides an estimate of exposures more likely to represent average exposures. The MLE risk estimates are used to put the RME risk estimates into context.

#### Estimation of Exposure Point Concentrations

Sample Statistics. Exposure to COPCs at the sites is best estimated by the use of the arithmetic mean concentration of a COPC in each medium. Because of the uncertainty associated with estimating the true average concentration at a site, the USEPA has required the use of the 95% UCL on the arithmetic mean as the EPC (USEPA, 2002a). Therefore, this is a very conservative estimate of the true arithmetic mean. RME EPCs in this risk assessment represent the lower of the maximum detected concentration or the 95% UCL on the mean (USEPA, 2002a). The appropriate UCL is selected based on the distribution of the dataset, as described in USEPA, 2002a and in Appendix I. Again to provide context, the MLE calculations have used the arithmetic mean concentration, not the upper bound, as the EPC. Note that in areas where there are fewer than 8 samples, the EPC was defaulted to the maximum detected concentration. This occurred for:

- Surface soil: Site O, Site O (North), Site P, Site Q (North), Site Q (Central), and Site S
- Combined soil: Site O, Site O (North), and Site S
- Fish tissue: River and Site Q Pond
- Leachate: Sites O, Q, and R

- Surface Water: Site Q Pond

Sample Location. In addition, the data used to calculate the EPCs are assumed to be representative of general site conditions. Sample locations in the sites were identified to be biased to represent worst-case site conditions.

Environmental Degradation. Finally, it is assumed that the EPCs calculated in the risk assessment based on current site conditions remain constant for the assumed exposure duration – for an industrial or residential scenario this is a period of 25 to 30 years. However, it is well known in the scientific community that constituents in the environment are subject to natural attenuation and biodegradation processes. Organic constituents are naturally degraded in the environment by a variety of processes (i.e., photodegradation, microbial activity, hydrolysis, etc.). USEPA has recognized the validity and utility of natural attenuation and biodegradation as a remedial option and has recently published guidance for its site-specific implementation (USEPA, 1997d). Environmental half-lives vary for specific constituents based on environmental conditions (i.e., presence of bacteria, pH, exposures to sunlight and oxygen), and there are respected literature sources of such information. However, environmental degradation is not typically accounted for in the calculation of risks for the site. This has likely resulted in an over-estimation of site risks.

Predicted EPCs. Models were used to predict the concentration of a volatile constituent in air based on its concentration in groundwater and in combined soil. Models were used to predict indoor air concentrations, outdoor air concentrations, and excavation trench air concentrations. Although assumptions are made about constituent behavior in each of these models, the assumptions used are conservative in that they tend to result in over-predictions rather than under-predictions of air concentrations.

#### Exposure Assumptions

When estimating potential human doses (i.e., intakes) from potential exposure to various media containing COPCs, several assumptions are made. Uncertainty may exist, for example, in assumptions concerning rates of ingestion, frequency and duration of exposure, and bioavailability of the constituents in the medium. Typically, when limited information is available to establish these assumptions, a conservative (i.e., health-protective) estimate of potential exposure is employed. Default exposure assumptions recommended by the USEPA are intended to be conservative and representative of an individual who consistently and frequently contacts environmental media at a site, a scenario that rarely occurs. Most individuals will contact media at non-site locations, while the risk assessment assumes that all exposure to environmental media will occur at the site. Moreover, it is often assumed that contact with environmental media occurs in the areas having the highest constituent concentrations for the entire exposure frequency/duration used in the risk assessment, due to both statistical handling of the data and the original sampling plan.

The assumptions regarding exposure frequency and duration are very conservative. For example, while the agency default for working tenure is 25 years, the average occupational tenure for an industrial/commercial worker is 4.2 years. The use of conservative assumptions is likely to lead to an overestimate of potential risk.

Per the USEPA-approved HHRA workplan, a meteorological factor was used in the risk assessment to account for the number of days when direct contact with soil or intrusive activities will not occur for receptors during inclement weather, i.e., when it is raining or snowing, when the ground is wet or frozen, or when snow or ice (32 degrees F) are covering the ground. This is not to say that workers or residents would not be outdoors on such days, only that the soil would not be available for significant contact either because it is wet or frozen. Thus, the exposure frequency was adjusted for these site-specific meteorological conditions. A meteorological factor of 24% was calculated (see Section 5.3.3). The meteorological factor was applied only to the outdoor industrial worker receptor (not to the indoor industrial worker, construction worker, trespassing teen, or recreational fisher receptors).

For the Site Q Pond, the RME recreational fisher receptor was assumed to ingest an average of 22 fish meals per year. However, the Site Q Ponds are ephemeral. Fish are present in the pond(s) only as a result of Mississippi River flood events; when the ponds dry up during dry weather, the fish die. This was the case during the SSP field program during the summer of 2002 - only one Site Q Pond had water and fish in it. It too subsequently dried out. Although at the time of the submission of this report there is a small amount of water in both ponds, its presence is due to heavy precipitation, and there are currently no fish in the ponds. Therefore, the assumption made for the RME receptor that the ponds can sustain a fish consumption rate of 22 fish meals per year is an overestimation of exposure.

#### **6.5.4 Risk Characterization**

The potential risk of adverse human health effects is characterized based on estimated potential exposures and potential dose-response relationships. Three areas of uncertainty are introduced in this phase of the risk assessment: the evaluation of potential exposure to multiple constituents, the combination of upper-bound exposure estimates with upper-bound toxicity estimates, and the risk to sensitive populations.

#### **6.5.5 Risk from Multiple Constituents**

Once potential exposure to and potential risk from each COPC is estimated, the total upper-bound potential risk posed by the site is determined by combining the estimated potential health risk from each of the COPC. Presently, potential carcinogenic effects are added unless evidence exists indicating that the COPC interact synergistically (a combined effect that is greater than a simple addition of potential individual effects) or antagonistically (a combined effect that is less than a simple addition of potential individual effects) with each other. For most combinations of constituents, little if

any evidence of interaction is available. Therefore, additivity is assumed. Although the IEPA TACO program provides a listing of groups of constituents that are considered to be additive in their carcinogenic potential, the USEPA approach of assuming additivity across all constituents was used in this risk assessment.

For noncarcinogenic effects, the Hazard Index (HI) should only be summed for constituents that have the same or similar toxic endpoints (USEPA, 1989a). The toxic endpoint is defined as the most sensitive noncarcinogenic health effect used to derive the RfD or other suitable toxicity value (USEPA, 1989a). Again, there is little evidence to suggest whether those COPCs associated with a common toxicity endpoint are additive, synergistic, antagonistic, or independent in terms of mechanism of action. Whether assuming additivity leads to an underestimation or overestimation of risk is unknown.

#### Combination of Several Upper-Bound Assumptions

Generally, the goal of a risk assessment is to estimate an upper-bound potential exposure and risk. Most of the assumptions about exposure and toxicity used in this evaluation are representative of statistical upper-bounds or even maxima for each parameter. The result of combining several such upper-bound assumptions is that the final estimate of potential exposure or potential risk is extremely conservative (health-protective).

This is best illustrated by a simple example. Assume that potential risk depends upon three variables (soil consumption rate, COPC concentration in soil and CSF). The mean, upper 95% bound and maximum are available for each variable.

One way to generate a conservative estimate of potential risk is to multiply the upper 95% bounds of the three parameters in this example. Doing so assumes that the 5% of the people who are most sensitive to the potential carcinogenic effects of a COPC will also ingest soil at a rate that exceeds the rate for 95% of the population, and that all the soil these people eat will have a constituent concentration that exceeds the concentration in 95% of the soil on site. The consequence of these assumptions is that the estimated potential risk is representative of 0.0125% of the population ( $0.05 \times 0.05 \times 0.05 = 0.000125 \times 100 = 0.0125\%$ ). Put another way, these assumptions overestimate risks for 99.99% of the population or 9,999 out 10,000 people. Thus, the majority of people will have a much lower level of potential risk. The very conservative nature of the potential risks estimated by the risk assessment process is not generally recognized. In reality, the estimates are more conservative than outlined above, because usually more than three upper 95% assumptions are used to estimate potential risk(s).

Alternatively, if a single upper 95% assumption of the cancer slope factor is combined with average (50th percentile) assumptions for soil concentration and soil ingestion rate, the resulting estimates of potential risk still overpredict risk for 99% of the potentially exposed population. This is a conservative

and health protective approach that substantially overestimates the “average” level and even the reasonable maximum level of potential risk.

The risk assessment approach used here employed upper 95% bounds or maxima for most RME exposure and toxicity assumptions. Thus, it produces estimates of potential risk two to three orders of magnitude greater than the risk experienced by the average member of the potentially exposed populations. The MLE scenarios have used average estimates of exposure where possible, but still use the conservative toxicity values, thus even the MLE risk estimates are likely to overestimate total risk.

#### **6.5.6 Risk to Sensitive Populations**

The health risks estimated in the risk characterization generally apply to the receptors whose activities and locations were described in the exposure assessment. Some people will always be more sensitive than the average person and, therefore, will be at greater risk. Dose-response values used to calculate risk, however, are frequently derived to account for additional sensitivity of subpopulations (e.g., the uncertainty factor of 10 used to account for intraspecies differences). Therefore, it is unlikely that this source of uncertainty contributes significantly to the overall uncertainty of the risk assessment.

#### **6.5.7 Summary of Sources of Uncertainty in Human Health Risk Assessment**

The large number of assumptions made in the risk characterization introduces uncertainty in the results. While this could potentially lead to underestimates of potential risk, the use of numerous conservative (i.e., protective of human health) assumptions, as was done here, results in overestimates of potential risks. Any one person's potential exposure and subsequent risk are influenced by all the parameters mentioned above and will vary on a case-by-case basis. Despite inevitable uncertainties associated with the steps used to derive potential risks, the use of numerous health-protective assumptions will most likely lead to a very large overestimate of potential risks from the site. Moreover, when evaluating risk assessment results, it is important to put the risks into perspective. For example, the background rate of cancer in the US is approximately 3,333 for a population of 10,000 people (Jemal, et al., 2002). The results of the risk assessment must be carefully interpreted considering the uncertainty and conservatism associated with the analysis, especially where site management decisions are made.

TABLE 6-1  
TOTAL POTENTIAL CARCINOGENIC RISK  
INDOOR INDUSTRIAL WORKER - RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS

Constituent	O	O North	Q North	Q South	R	
	AA-O-1-16 (a)	Leachate L-O-1	Leachate L-Q-1	AA-Q-6-24 (b)	AA-R-1-28 (b)	Leachate L-R-1
	Inhalation Risk	Inhalation Risk	Inhalation Risk	Inhalation Risk	Inhalation Risk	Inhalation Risk
<b>VOCs</b>						
1,2-Dichloroethane	NCOPC	NCOPC	3.00E-08	NCOPC	NCOPC	1.92E-09
1,2-Dichloroethene (total)	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NC	NC	NCOPC	NCOPC	NCOPC
Acetone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Benzene	NCOPC	1.10E-08	1.26E-08	8.72E-09	8.64E-09	9.30E-10
Chlorobenzene	NCOPC	NC	NC	NCOPC	NC	NC
Chloroform	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	4.48E-09
Chloromethane	NCOPC	NCOPC	NCOPC	NCOPC	6.11E-08	NCOPC
Dichloromethane	NCOPC	NCOPC	1.29E-09	NCOPC	NCOPC	8.53E-11
Tetrachloroethene	NCOPC	NCOPC	8.73E-08	NCOPC	NCOPC	7.49E-09
Toluene	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Trichloroethylene	NCOPC	NCOPC	1.08E-06	NCOPC	NCOPC	8.62E-08
<b>Total</b>	<b>NCOPC</b>	<b>1.10E-08</b>	<b>1.21E-06</b>	<b>8.72E-09</b>	<b>6.98E-08</b>	<b>1.01E-07</b>
<b>Notes</b> NC - No dose-response value NCOPC - Not a constituent of potential concern in this area/medium RME - Reasonable Maximum Exposure VOCs - Volatile Organic Compounds (a) Shallow groundwater (b) Mid groundwater						

TABLE 6-2  
TOTAL POTENTIAL HAZARD INDEX  
INDOOR INDUSTRIAL WORKER - RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS

Constituent	O	O North	Q North	Q South	R	
	AA-O-1-16 (a)	Leachate L-O-1	Leachate L-Q-1	AA-Q-6-24 (b)	AA-R-1-28 (b)	Leachate L-R-1
	Inhalation HQ	Inhalation HQ	Inhalation HQ	Inhalation HQ	Inhalation HQ	Inhalation HQ
<b>VOCs</b>						
1,2-Dichloroethane	NCOPC	NCOPC	6.59E-04	NCOPC	NCOPC	4.23E-05
1,2-Dichloroethene (total)	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.18E-08
4-Methyl-2-pentanone (MIBK)	NCOPC	1.02E-07	1.21E-07	NCOPC	NCOPC	NCOPC
Acetone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Benzene	NCOPC	4.65E-04	5.35E-04	3.70E-04	3.67E-04	3.94E-05
Chlorobenzene	NCOPC	1.19E-04	1.38E-04	NCOPC	9.36E-05	1.17E-05
Chloroform	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.65E-05
Chloromethane	NCOPC	NCOPC	NCOPC	NCOPC	1.06E-03	NCOPC
Dichloromethane	NCOPC	NCOPC	2.55E-06	NCOPC	NCOPC	1.69E-07
Tetrachloroethene	NCOPC	NCOPC	6.85E-05	NCOPC	NCOPC	5.88E-06
Toluene	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	3.32E-06
Trichloroethylene	NCOPC	NCOPC	7.54E-04	NCOPC	NCOPC	6.03E-05
<b>Total HI</b>	<b>NCOPC</b>	<b>5.84E-04</b>	<b>2.16E-03</b>	<b>3.70E-04</b>	<b>1.52E-03</b>	<b>1.80E-04</b>
<b>Notes</b> HI - Hazard Index HQ - Hazard Quotient NC - No dose-response value NCOPC - Not a constituent of potential concern in this area/medium RME - Reasonable Maximum Exposure VOCs - Volatile Organic Compounds (a) Shallow groundwater (b) Mid groundwater						

TABLE 6-3  
TOTAL POTENTIAL CARCINOGENIC RISK  
OUTDOOR INDUSTRIAL WORKER - RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS

Constituent	O				O North				P			Q North			
	Soil (a)		Total Risk	Inhalation	Soil (a)		Total Risk	Inhalation	Soil (a)		Total Risk	Soil (a)		Total Risk	Inhalation
	Ing/Derm	Inhalation			Ing/Derm	Inhalation			Ing/Derm	Inhalation		Ing/Derm	Inhalation		
<b>VOCs</b>															
1,1,2-Trichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,2-Dichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	2.83E-07	3.09E-07	5.72E-07
1,2-Dichloroethane (Total)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Acetone	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Benzene	NCOPC	9.16E-08	NCOPC	9.16E-08	NCOPC	1.73E-06	2.36E-08	1.75E-06	NCOPC	5.76E-08	5.76E-08	NCOPC	4.97E-08	1.02E-08	5.99E-08
Chlorobenzene	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Chloroform	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	4.64E-07	NCOPC	4.64E-07	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.79E-10	1.79E-10
Ethylbenzene	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NCOPC	NC
Tetrachloroethene	NCOPC	NCOPC	NCOPC	NC	NCOPC	4.64E-07	NCOPC	4.64E-07	NCOPC	2.14E-08	2.14E-08	NCOPC	4.00E-07	1.07E-08	4.10E-07
Toluene	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Trichloroethylene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	2.58E-08	2.58E-08	NCOPC	3.26E-07	1.18E-07	4.45E-07
Xylenes Total	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NCOPC	NC
<b>SVOCS</b>															
2,4,6-Trichlorophenol	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2-Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4-Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(a)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(a)pyrene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	2.08E-07	9.83E-11	2.08E-07	5.53E-07	2.59E-10	NCOPC	5.53E-07
Benzo(b)fluoranthene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1.14E-07	5.32E-11	NCOPC	1.14E-07
<b>Pesticides</b>															
4,4-DDT	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
beta-BHC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dieldrin	3.88E-07	1.34E-10	NCOPC	3.88E-07	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Heptachlor	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
<b>Herbicides</b>															
Pentachlorophenol	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
<b>PCBs</b>															
Total PCBs	2.53E-06	1.00E-09	NCOPC	2.53E-06	1.66E-04	4.37E-08	NCOPC	1.66E-04	1.65E-08	6.51E-10	1.65E-08	4.39E-07	1.73E-10	NCOPC	4.39E-07
Dioxin															
2,3,7,8-TCDD-TEQ	5.36E-05	2.27E-08	NCOPC	5.36E-05	4.59E-04	1.29E-07	NCOPC	4.59E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
<b>Metals</b>															
Antimony	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Arsenic	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	1.56E-06	1.82E-08	1.56E-06	NCOPC	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	2.89E-08	NCOPC	2.89E-08
Chromium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Manganese	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Mercury	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
<b>Total</b>	<b>5.65E-05</b>	<b>9.19E-08</b>	<b>NCOPC</b>	<b>6.57E-05</b>	<b>6.25E-04</b>	<b>2.83E-08</b>	<b>2.36E-08</b>	<b>6.28E-04</b>	<b>3.41E-08</b>	<b>4.80E-08</b>	<b>8.22E-08</b>	<b>1.10E-06</b>	<b>1.07E-08</b>	<b>4.49E-07</b>	<b>2.62E-06</b>

Notes

(a) Surface soil for ing/derm and inhalation of nonvolatile constituents; combined soil for inhalation of volatiles  
Ing/Derm - Ingestion/Dermal Contact  
NCOPC - Not a constituent of potential concern in this area/medium  
NC - Not Calculated or no dose-response value  
PCBs - Polychlorinated Biphenyls  
RME - Reasonable Maximum Exposure  
SVOCS - Semivolatile Organic Compounds  
TCDD - TEQ - Tetrachlorodibenzo-p-dioxin  
Toxic Equivalents Concentration  
VOCs - Volatile Organic Compounds

TABLE 6-3  
TOTAL POTENTIAL CARCINOGENIC RISK  
OUTDOOR INDUSTRIAL WORKER - RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS

Constituent	Q Central			Q South				R						S		
	Soil (a)		Total Risk	Soil (a)		AA-Q-6-24	Total Risk	Soil (a)		AA-R-1-28	Leachate	Max Value	Total Risk	Soil (a)		Total Risk
	Ing/Derm	Inhalation		Ing/Derm	Inhalation			Ing/Derm	Inhalation					Ing/Derm	Inhalation	
<b>VOCs</b>																
1,1,2-Trichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	9.52E-08	NCOPC	NCOPC	NC	9.52E-08	NCOPC	NCOPC	NC
1,2-Dichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	8.97E-07	NCOPC	6.19E-06	6.19E-06	7.06E-06	NCOPC	NCOPC	NC
1,2-Dichloroethane (total)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC
Acetone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
Benzene	NCOPC	NCOPC	NC	NCOPC	8.90E-09	1.05E-08	1.94E-08	NCOPC	1.26E-07	4.71E-11	1.49E-07	1.49E-07	2.75E-07	NCOPC	8.38E-08	8.38E-08
Chlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NC	NC
Chloroform	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	7.04E-08	NCOPC	2.53E-07	2.53E-07	3.23E-07	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	3.64E-12	NCOPC	3.64E-12	3.64E-12	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	6.15E-09	6.15E-09	6.15E-09	6.15E-09	NCOPC	4.81E-08	4.81E-08
Ethylbenzene	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC
Tetrachloroethene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	2.07E-08	NCOPC	4.00E-08	4.00E-08	6.07E-08	NCOPC	1.50E-07	1.50E-07
Toluene	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NC	NC
Trichloroethylene	NCOPC	NCOPC	NC	NCOPC	8.02E-08	NCOPC	8.02E-08	NCOPC	6.12E-04	NCOPC	6.93E-04	6.93E-04	1.31E-03	NCOPC	6.80E-05	6.80E-05
Xylenes Total	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC
<b>SVOCS</b>																
2,4,6-Trichlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.21E-08	4.12E-12	1.21E-08
2-Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC
4-Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC
Benzo(a)anthracene	NCOPC	NCOPC	NC	3.16E-08	1.48E-11	NCOPC	3.16E-08	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.46E-07	1.15E-10	2.46E-07
Benzo(a)pyrene	NCOPC	NCOPC	NC	3.22E-07	1.51E-10	NCOPC	3.23E-07	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.66E-06	7.78E-10	1.66E-06
Benzo(b)fluoranthene	NCOPC	NCOPC	NC	4.14E-08	1.94E-11	NCOPC	4.15E-08	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.03E-07	9.48E-11	2.03E-07
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	5.53E-07	2.59E-10	5.53E-07
<b>Pesticides</b>																
4,4-DDT	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	7.32E-07	2.52E-10	7.32E-07
beta-BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	6.30E-06	2.24E-09	6.30E-06
Dieldrin	NCOPC	NCOPC	NC	5.79E-07	2.01E-10	NCOPC	5.79E-07	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.31E-06	NC	1.31E-06
Heptachlor	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	9.08E-07	3.16E-10	9.08E-07
<b>Herbicides</b>																
Pentachlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	7.11E-06	NC	7.11E-06
<b>PCBs</b>																
Total PCBs	6.04E-07	2.39E-10	6.04E-07	1.20E-06	4.73E-10	NCOPC	1.20E-06	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.37E-04	9.35E-08	2.37E-04
Dioxin																
2,3,7,8-TCDD-TEQ	2.99E-05	1.26E-08	2.99E-05	1.53E-05	6.46E-09	NCOPC	1.53E-05	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
<b>Metals</b>																
Antimony	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Arsenic	7.80E-07	9.10E-09	7.89E-07	8.10E-07	9.45E-09	NCOPC	8.20E-07	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Chromium	NCOPC	NCOPC	NC	NC	3.52E-07	NCOPC	3.52E-07	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Manganese	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Mercury	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
<b>Total</b>	<b>3.13E-05</b>	<b>2.20E-08</b>	<b>3.13E-05</b>	<b>1.82E-05</b>	<b>4.58E-07</b>	<b>1.05E-08</b>	<b>1.87E-05</b>	<b>NCOPC</b>	<b>6.15E-04</b>	<b>5.08E-11</b>	<b>7.04E-04</b>	<b>7.04E-04</b>	<b>1.32E-03</b>	<b>2.56E-04</b>	<b>6.84E-05</b>	<b>3.24E-04</b>

Notes

(a) Surface soil for ing/derm and inhalation of nonvolatile constituents; combined soil for inhalation of volatiles  
Ing/Derm - Ingestion/Dermal Contact  
NCOPC - Not a constituent of potential concern in this area/medium  
NC - Not Calculated or no dose-response value  
PCBs - Polychlorinated Biphenyls  
RME - Reasonable Maximum Exposure  
SVOCS - Semivolatile Organic Compounds  
TCDD - TEQ - Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration  
VOCs - Volatile Organic Compounds

TABLE 6-4  
TOTAL POTENTIAL HAZARD INDEX  
OUTDOOR INDUSTRIAL WORKER - RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RVFS

Constituent	O				O North				P				Q North			
	Soil (s)		Inhalation	Total HQ	Soil (s)		Leachate	Total HQ	Soil (s)		Total HQ		Soil (s)		Leachate	Total HQ
	Ing/Derm	Inhalation			Ing/Derm	Inhalation			Ing/Derm	Inhalation			Ing/Derm	Inhalation		
<b>VOCs</b>																
1,1,2-Trichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
1,2-Dichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	5.78E-03	6.80E-03	1.26E-02
1,2-Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	4.11E-06	4.11E-06	NCOPC	NCOPC	NC		NCOPC	NCOPC	5.44E-06	5.44E-06
Acetone	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NC	NC
Benzene	NCOPC	3.89E-01	NCOPC	3.89E-01	NCOPC	7.33E-02	9.99E-04	7.43E-02	NCOPC	2.44E-03	2.44E-03		NCOPC	2.11E-03	4.33E-04	2.54E-03
Chlorobenzene	NCOPC	2.91E-01	NCOPC	2.91E-01	NCOPC	2.58E-01	6.72E-04	2.58E-01	NCOPC	NCOPC	NC		NCOPC	NCOPC	4.03E-04	4.03E-04
Chloroform	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	9.19E-04	NCOPC	9.19E-04	NCOPC	NCOPC	NC		NCOPC	NCOPC	3.54E-07	3.54E-07
Ethylbenzene	NCOPC	6.32E-02	NCOPC	6.32E-02	NCOPC	2.40E-02	NCOPC	2.40E-02	NCOPC	4.33E-03	4.33E-03		NCOPC	2.98E-04	NCOPC	2.98E-04
Tetrachloroethene	NCOPC	NCOPC	NCOPC	NC	NCOPC	3.64E-04	NCOPC	3.64E-04	NCOPC	1.68E-03	1.68E-03		NCOPC	3.14E-04	8.40E-06	3.22E-04
Toluene	NCOPC	2.25E-02	NCOPC	2.25E-02	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
Trichloroethylene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	1.81E-03	1.81E-03		NCOPC	2.28E-04	6.28E-05	3.11E-04
Xylenes Total	NCOPC	3.23E+00	NCOPC	3.23E+00	NCOPC	1.23E+00	NCOPC	1.23E+00	NCOPC	2.33E-01	2.33E-01		NCOPC	2.23E-02	NCOPC	2.23E-02
<b>SVOCs</b>																
2,4,6-Trichlorophenol	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
2-Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
4-Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
Benzo(a)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
Benzo(a)pyrene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC		NC	NC	NCOPC	NC
Benzo(b)fluoranthene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NC	NC	NCOPC	NC
<b>Pesticides</b>																
4,4-DDT	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
beta-BHC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
Dieldrin	1.36E-03	NC	NCOPC	1.36E-03	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
Heptachlor	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
<b>Herbicides</b>																
Pentachlorophenol	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
<b>PCBs</b>																
Total PCBs	1.77E-01	NC	NCOPC	1.77E-01	1.18E+01	NC	NCOPC	1.18E+01	1.15E-01	NC	1.15E-01		3.07E-02	NC	NCOPC	3.07E-02
Dioxin	NC	NC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
2,3,7,8-TCDD TEQ	NC	NC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
<b>Metals</b>																
Antimony	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
Arsenic	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	9.71E-03	NC	9.71E-03		NCOPC	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		3.80E-02	NC	NCOPC	3.80E-02
Chromium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
Manganese	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
Mercury	NCOPC	NCOPC	NCOPC	NC	1.07E-01	4.33E-05	NCOPC	1.07E-01	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC
<b>Total HQ</b>	1.79E-01	4.00E+00	NCOPC	4.18E+00	1.18E+01	1.56E+00	1.68E-03	1.33E+01	1.26E-01	2.43E-01	3.64E-01		8.87E-02	3.10E-02	7.73E-03	1.04E-01
<b>Notes:</b> (a) - Surface soil for Ing/Derm and inhalation of nonvolatile constituents combined soil for inhalation of volatiles Ing/Derm - Ingestion/Dermal Contact HI - Hazard Index HQ - Hazard Quotient NCOPC - Not a constituent of potential concern in this area/medium NC - Not Calculated or no dose-response value PCBs - Polychlorinated Biphenyls RME - Reasonable Maximum Exposure SVOCs - Semivolatile Organic Compounds TCDD TEQ - Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration VOCs - Volatile Organic Compounds																

TABLE 6-4  
TOTAL POTENTIAL HAZARD INDEX  
OUTDOOR INDUSTRIAL WORKER - RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/V/S

Constituent	Q Central			Q South				R						S		
	Soil (s)		Total HQ	Soil (s)		AA-Q-6-24 Inhalation	Total HQ	Soil (s)		AA-R-1-28 Inhalation	Leachate Inhalation	Max Value Inhalation	Total HQ	Soil (s)		Total HQ
	Ing/Derm	Inhalation		Ing/Derm	Inhalation			Ing/Derm	Inhalation					Ing/Derm	Inhalation	
VOCs																
1,1,2-Trichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
1,2-Dichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	1.97E-02	NCOPC	1.36E-01	1.36E-01	1.56E-01	NCOPC	NCOPC	NC
1,2-Dichloroethane (total)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	2.43E-05	2.43E-05	2.43E-05	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	2.22E-03	2.22E-03
Acetone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
Benzene	NCOPC	NCOPC	NC	NCOPC	3.78E-04	4.44E-04	8.22E-04	NCOPC	5.33E-03	2.00E-06	6.33E-03	6.33E-03	1.17E-02	NCOPC	3.55E-03	3.55E-03
Chlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	1.57E-02	3.25E-06	4.09E-04	4.09E-04	1.81E-02	NCOPC	3.25E-02	3.25E-02
Chloroform	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	2.60E-04	NCOPC	9.32E-04	9.32E-04	1.19E-03	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	6.29E-08	NCOPC	6.29E-08	6.29E-08	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.22E-05	1.22E-05	1.22E-05	1.22E-05	NCOPC	9.52E-05	9.52E-05
Ethylbenzene	NCOPC	NCOPC	NC	NCOPC	1.35E-03	NCOPC	1.35E-03	NCOPC	2.08E-05	NCOPC	NCOPC	NC	2.08E-05	NCOPC	1.40E-03	1.40E-03
Tetrachloroethene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	1.82E-03	NCOPC	3.14E-03	3.14E-03	4.76E-03	NCOPC	1.18E-04	1.18E-04
Toluene	NCOPC	NCOPC	NC	NCOPC	1.59E-02	NCOPC	1.59E-02	NCOPC	1.87E-03	NCOPC	1.59E-03	1.59E-03	3.26E-03	NCOPC	3.26E-02	3.26E-02
Trichloroethylene	NCOPC	NCOPC	NC	NCOPC	5.82E-05	NCOPC	5.82E-05	NCOPC	4.28E-01	NCOPC	4.86E-01	4.86E-01	9.14E-01	NCOPC	4.76E-02	4.76E-02
Xylenes Total	NCOPC	NCOPC	NC	NCOPC	9.88E-02	NCOPC	9.88E-02	NCOPC	1.40E-04	NCOPC	NCOPC	NC	1.40E-04	NCOPC	1.17E-01	1.17E-01
SVOGs																
2,4,6-Trichlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	3.09E-02	NC	3.09E-02
2-Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	1.04E-05	1.04E-05
4-Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	7.18E-03	6.49E-06	7.17E-03
Benzo(a)anthracene	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC
Benzo(a)pyrene	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC
Benzo(b)fluoranthene	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC
Pesticides																
4,4-DDT	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.21E-02	NC	1.21E-02
beta-BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	3.27E-02	NC	3.27E-02
Dieldrin	NCOPC	NCOPC	NC	2.03E-03	NC	NCOPC	2.03E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	9.42E-03	NC	9.42E-03
Heptachlor	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.13E-03	NC	1.13E-03
Herbicides																
Pentachlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	5.53E-03	NC	5.53E-03
PCBs																
Total PCBs	4.23E-02	NC	4.23E-02	8.38E-02	NC	NCOPC	8.38E-02	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.66E+01	NC	1.66E+01
Dioxin																
2,3,7,8-TCDD TEQ	NC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Metals																
Antimony	NCOPC	NCOPC	NC	1.34E-02	NC	NCOPC	1.34E-02	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Arsenic	4.88E-03	NC	4.88E-03	5.04E-03	NC	NCOPC	5.04E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Chromium	NCOPC	NCOPC	NC	6.73E-03	8.21E-04	NCOPC	7.55E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Manganese	NCOPC	NCOPC	NC	1.35E-02	7.81E-03	NCOPC	2.13E-02	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Mercury	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Total HQ	4.71E-02	NC	4.71E-02	1.24E-01	1.23E-01	4.44E-04	2.48E-01	NCOPC	4.73E-01	5.31E-06	8.34E-01	8.34E-01	1.11E+00	1.87E+01	2.37E-01	1.69E+01
Notes (s) - Surface soil for ing/derm and inhalation of nonvolatile constituents, combined soil for inhalation of volatiles Ing/Derm - Ingestion/Dermal Contact HI - Hazard Index HQ - Hazard Quotient NCOPC - Not a constituent of potential concern in this area/medium NC - Not Calculated or no dose-response value PCBs - Polychlorinated Biphenyls RME - Reasonable Maximum Exposure SVOGs - Semivolatile Organic Compounds TCDD - TEQ - Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration VOCs - Volatile Organic Compounds																

TABLE 6.5  
TOTAL POTENTIAL CARCINOGENIC RISK  
CONSTRUCTION/UTILITY WORKER, RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RIFS

Constituent	O					O North					P					Q North				
	Combined Soil		AA-O-1-18		Total Risk	Combined Soil		Leachate		Total Risk	Combined Soil		Total Risk	Combined Soil		Total Risk	Combined Soil		Total Risk	Total Risk
	Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation		
VOCs																				
1,1,2-Trichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,2-Dichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,2-Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Acetone	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Benzene	1.89E-08	2.98E-08	NCOPC	NCOPC	2.98E-08	2.61E-09	4.13E-07	1.19E-08	8.58E-08	5.14E-07	4.23E-11	6.54E-09	5.59E-09	6.09E-11	9.64E-09	5.50E-09	3.96E-08	NC	NC	5.48E-08
Chlorobenzene	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Chloroform	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.61E-09	1.47E-07	NCOPC	NCOPC	1.49E-07	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	1.11E-09
Ethylbenzene	NC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC
Tetrachloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	8.73E-09	1.13E-07	NCOPC	NCOPC	1.21E-07	1.98E-08	2.83E-07	2.83E-07	6.29E-09	8.27E-08	4.12E-08	1.87E-08	NCOPC	NCOPC	1.49E-07
Toluene	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Trichloroethylene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	9.42E-10	2.86E-07	2.87E-07	1.98E-10	5.73E-08	2.61E-09	9.24E-08	NCOPC	NCOPC	1.52E-07
Xylenes Total	NC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC
SVOCs																				
1,2-Dichlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,3-Dichlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,4-Dichlorobenzene	2.68E-09	2.78E-11	NCOPC	NCOPC	2.71E-09	6.85E-09	7.09E-11	NCOPC	NCOPC	6.82E-09	3.82E-09	3.98E-11	3.88E-09	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
2,4,6-Trichlorophenol	1.81E-10	2.01E-12	NCOPC	NCOPC	1.83E-10	1.60E-09	1.78E-11	4.02E-09	NCOPC	5.63E-09	NCOPC	NCOPC	NC	2.56E-10	2.84E-12	1.32E-07	NCOPC	NCOPC	NCOPC	1.32E-07
2,4-Dichlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2,4-Dimethylphenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2-Chlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2-Methylnaphthalene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2-Nitroaniline	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC
3-Methylphenol/4-Methylphenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4-Chloroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4-Nitroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(a)anthracene	8.17E-09	9.98E-11	NCOPC	NCOPC	8.27E-09	2.45E-08	3.00E-10	NCOPC	NCOPC	2.48E-08	NCOPC	NCOPC	NC	1.10E-09	1.34E-11	NCOPC	NCOPC	NCOPC	NCOPC	1.11E-09
Benzo(a)pyrene	4.83E-08	5.91E-10	2.62E-07	NCOPC	3.11E-07	7.49E-08	9.15E-10	NCOPC	NCOPC	7.58E-08	4.58E-09	5.87E-11	4.62E-09	1.14E-08	1.39E-10	NCOPC	NCOPC	NCOPC	NCOPC	1.15E-08
Benzo(b)fluoranthene	5.38E-09	6.57E-11	1.80E-08	NCOPC	2.35E-08	8.17E-09	9.98E-11	NCOPC	NCOPC	8.27E-09	NCOPC	NCOPC	NC	1.03E-09	1.28E-11	NCOPC	NCOPC	NCOPC	NCOPC	1.04E-09
Benzo(g,h,i)perylene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(k)fluoranthene	NCOPC	NCOPC	1.98E-09	NCOPC	1.98E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
bis(2-Chloroethyl)ether	NCOPC	NCOPC	NCOPC	NCOPC	NC	5.49E-09	6.81E-11	NCOPC	NCOPC	5.56E-09	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
bis(2-Ethylhexyl)phthalate	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dibenz(a,h)anthracene	2.04E-08	2.50E-10	9.94E-07	NCOPC	1.01E-06	3.13E-08	3.83E-10	NCOPC	NCOPC	3.17E-08	NCOPC	NCOPC	NC	1.92E-09	2.35E-11	NCOPC	NCOPC	NCOPC	NCOPC	1.94E-09
Hexachlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.75E-08	1.94E-10	NCOPC	NCOPC	1.76E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Indeno(1,2,3-cd)pyrene	NCOPC	NCOPC	7.77E-08	NCOPC	7.77E-08	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Naphthalene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Nitrobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Phenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Pesticides																				
4,4'-DDE	NCOPC	NCOPC	NCOPC	NCOPC	NC	2.87E-08	NC	NCOPC	NCOPC	2.87E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4,4'-DDT	NCOPC	NCOPC	NCOPC	NCOPC	NC	4.89E-08	5.28E-10	NCOPC	NCOPC	4.74E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Aldrin	2.91E-08	3.31E-10	NCOPC	NCOPC	2.94E-08	1.82E-07	2.07E-09	NCOPC	NCOPC	1.84E-07	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
alpha-BHC	NCOPC	NCOPC	NCOPC	NCOPC	NC	2.25E-08	2.54E-10	NCOPC	NCOPC	2.27E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
beta-BHC	NCOPC	NCOPC	NCOPC	NCOPC	NC	8.99E-08	1.05E-09	1.47E-08	NCOPC	9.24E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	7.94E-09
delta-BHC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dieldrin	1.45E-07	1.84E-09	NCOPC	NCOPC	1.48E-07	1.92E-08	2.16E-08	NCOPC	NCOPC	1.92E-08	1.08E-08	1.22E-10	1.09E-08	2.22E-08	2.82E-10	NCOPC	NCOPC	NCOPC	NCOPC	2.25E-08
Endrin Keatons	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	8.90E-09	NC	NCOPC	NCOPC	8.90E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Heptachlor	2.98E-08	3.39E-10	NCOPC	NCOPC	3.01E-08	1.08E-07	1.21E-09	NCOPC	NCOPC	1.07E-07	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Heptachlor epoxide	1.02E-08	1.15E-10	NCOPC	NCOPC	1.03E-08	5.84E-08	6.89E-10	NCOPC	NCOPC	5.91E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Herbicides																				
2,4,5-T	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2,4-D	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
MCPA	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
MCPP	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Pentachlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.14E-08	NCOPC	1.14E-08	NCOPC	NCOPC	NC	4.65E-08	NC	6.71E-08	NCOPC	NCOPC	NCOPC	6.78E-08

TABLE 6.5  
TOTAL POTENTIAL CARCINOGENIC RISK  
CONSTRUCTION/UTILITY WORKER RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RVFS

Constituent	O					O North					P			Q North				
	Combined Soil		AA-O-1-16		Total Risk	Combined Soil		Leachate		Total Risk	Combined Soil		Total Risk	Combined Soil		Leachate		Total Risk
	Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation	Ing/Derm	Inhalation	
PCBs																		
Total PCBs	1.44E-06	1.60E-08	NCOPC	NCOPC	1.46E-06	1.47E-05	1.83E-07	1.60E-06	NCOPC	1.65E-05	6.19E-08	9.07E-10	6.28E-08	2.62E-07	2.90E-09	3.05E-08	NCOPC	2.95E-07
Dioxin																		
2,3,7,8-TCDD-TEQ	6.67E-06	6.73E-08	NCOPC	NCOPC	6.73E-06	1.09E-04	1.10E-06	4.85E-06	NCOPC	1.15E-04	9.69E-08	9.79E-10	9.79E-08	2.43E-06	2.46E-08	NCOPC	NCOPC	2.46E-06
Metals																		
Antimony	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC
Arsenic	NCOPC	NCOPC	3.25E-08	NCOPC	3.25E-09	3.80E-08	1.50E-06	NCOPC	NCOPC	5.30E-08	1.74E-06	6.88E-08	2.42E-08	1.58E-06	6.24E-09	NCOPC	NCOPC	2.21E-08
Barium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
Beryllium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.45E-08	NCOPC	NCOPC	1.45E-08	NC	2.25E-09	2.25E-09	NC	3.20E-09	NCOPC	NCOPC	3.20E-09
Chromium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Cobalt	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Copper	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Lead	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
Manganese	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC
Mercury	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Nickel	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC
Thallium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Vanadium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Zinc	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC
Total	8.44E-06	3.05E-06	1.36E-06	NCOPC	1.28E-05	1.26E-04	2.00E-06	7.61E-06	6.58E-06	1.36E-04	2.36E-07	5.67E-07	6.83E-07	2.80E-06	2.15E-07	6.96E-06	2.51E-06	1.25E-05
Notes Ing/Derm - Ingestion/Dermal Contact NC - Not Calculated or no dose-response value NCOPC - Not a constituent of potential concern in this area/medium PCBs - Polychlorinated Biphenyls RME - Reasonable Maximum Exposure SVOCs - Semivolatile Organic Compounds TCDD - TEQ - Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration VOCs - Volatile Organic Compounds																		

TABLE 6.5  
TOTAL POTENTIAL CARCINOGENIC RISK  
CONSTRUCTION/UTILITY WORKER: RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS

Constituent	Q Central			Q South			R					S		
	Combined Soil		Total Risk	Combined Soil		Total Risk	Combined Soil		Leachate		Total Risk	Combined Soil		Total Risk
	Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation	
VOCs														
1,1,2-Trichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4.31E-10	6.28E-09	NCOPC	NCOPC	6.69E-09	NCOPC	NCOPC	NC
1,2-Dichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	7.10E-09	5.70E-08	5.77E-07	5.48E-05	5.54E-05	NCOPC	NCOPC	NC
1,2-Dichloroethane (total)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
Acetone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
Benzene	NCOPC	NCOPC	NC	1.13E-11	1.79E-09	1.80E-09	1.97E-09	8.27E-09	8.60E-08	6.34E-07	7.33E-07	1.32E-09	5.51E-09	6.63E-09
Chlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Chloroform	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	4.52E-09	NC	1.30E-06	1.31E-06	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.31E-09	4.24E-08	4.47E-08	1.06E-09	3.18E-09	4.22E-09
Ethylbenzene	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC
Tetrachloroethene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	5.72E-07	1.32E-07	1.65E-05	7.47E-06	2.48E-05	4.24E-08	1.03E-08	5.27E-08
Toluene	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Trichloroethylene	NCOPC	NCOPC	NC	4.91E-11	1.45E-08	1.45E-08	2.06E-06	4.12E-05	1.98E-05	6.93E-04	7.56E-04	2.28E-07	4.47E-06	4.70E-06
Xylenes Total	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC
SVOCs														
1,2-Dichlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
1,3-Dichlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
1,4-Dichlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	3.66E-10	3.79E-12	NCOPC	NCOPC	3.70E-10	1.14E-08	1.18E-10	1.15E-08
2,4,6-Trichlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4.45E-09	4.96E-11	NCOPC	NCOPC	4.50E-09	2.15E-10	2.39E-12	2.17E-10
2,4-Dichlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2,4-Dimethylphenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2-Chlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC
2-Methylnaphthalene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2-Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC
3-Methylphenol/4-Methylphenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
4-Chloroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
4-Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NC	NC	NC
Benzo(a)anthracene	7.28E-10	8.90E-12	7.37E-10	7.01E-10	8.57E-12	7.10E-10	NCOPC	NCOPC	NCOPC	NCOPC	NC	5.44E-09	6.66E-11	5.51E-09
Benzo(a)pyrene	8.44E-09	1.03E-10	8.54E-09	7.76E-09	9.48E-11	7.85E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	3.68E-08	4.49E-10	3.72E-08
Benzo(b)fluoranthene	1.09E-09	1.33E-11	1.10E-09	8.03E-10	9.82E-12	8.13E-10	NCOPC	NCOPC	NCOPC	NCOPC	NC	4.49E-09	5.49E-11	4.55E-09
Benzo(g,h,i)perylene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Benzo(k)fluoranthene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
bis(2-Chloroethyl)ether	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
bis(2-Ethylhexyl)phthalate	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	4.17E-09	NC	4.17E-09
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.23E-08	1.50E-10	1.24E-08
Hexachlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Indeno(1,2,3-cd)pyrene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Naphthalene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC
Nitrobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Phenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Pesticides														
4,4-DDE	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4,4-DDT	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	5.75E-07	NCOPC	5.75E-07	1.29E-08	1.46E-10	1.31E-08
Aldrin	1.37E-09	1.58E-11	1.39E-09	2.74E-09	3.12E-11	2.77E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	7.68E-09	8.75E-11	7.77E-09
alpha-BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
beta-BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	3.22E-09	3.75E-11	1.18E-07	NCOPC	1.21E-07	1.11E-07	1.29E-09	1.13E-07
delta-BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Dieldrin	5.59E-09	6.35E-11	5.65E-09	1.92E-08	2.18E-10	1.94E-08	4.64E-08	5.27E-10	9.93E-07	NCOPC	1.04E-06	1.45E-08	1.64E-10	1.46E-08
Endrin Ketone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.06E-08	NCOPC	1.06E-08	2.32E-08	NC	2.32E-08
Heptachlor	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4.76E-09	5.43E-11	2.20E-07	NCOPC	2.25E-07	1.61E-08	1.63E-10	1.62E-08
Heptachlor epoxide	NCOPC	NCOPC	NC	2.23E-09	2.62E-11	2.25E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Herbicides														
2,4,5-T	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2,4-D	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
MCPA	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
MCPP	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Pentachlorophenol	1.66E-09	NC	1.66E-09	2.21E-08	NC	2.21E-08	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.26E-07	NC	1.26E-07

TABLE 6.5  
TOTAL POTENTIAL CARCINOGENIC RISK  
CONSTRUCTION/UTILITY WORKER RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/F/S

Constituent	Q Central			Q South			R					S		
	Combined Soil		Total Risk	Combined Soil		Total Risk	Combined Soil		Leachate		Total Risk	Combined Soil		Total Risk
	Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation	
PCBs														
Total PCBs	2.11E-08	2.33E-10	2.13E-08	9.21E-08	1.02E-09	9.31E-08	4.31E-07	4.77E-09	1.18E-04	NCOPC	1.17E-04	4.89E-06	5.41E-08	4.94E-06
Dioxin														
2,3,7,8-TCDD-TEQ	6.31E-07	8.39E-09	8.40E-07	9.89E-07	9.99E-09	9.99E-07	3.90E-07	3.94E-09	2.22E-06	NCOPC	2.28E-06	5.87E-06	6.73E-08	5.73E-06
Metals														
Antimony	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Arsenic	2.28E-08	9.00E-09	3.18E-08	1.77E-08	6.97E-09	2.46E-08	7.52E-09	2.97E-09	NCOPC	NCOPC	1.05E-08	NCOPC	NCOPC	NC
Barium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Beryllium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Chromium	NCOPC	NCOPC	NC	NC	1.47E-07	1.47E-07	NCOPC	NCOPC	NC	NCOPC	NC	NC	5.41E-07	5.41E-07
Cobalt	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Copper	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Lead	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
Manganese	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Mercury	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Nickel	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Thallium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Vanadium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Zinc	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Total	6.94E-07	1.78E-06	9.12E-07	1.15E-06	1.81E-07	1.34E-06	3.58E-06	4.14E-08	1.77E-04	7.87E-04	9.79E-04	1.12E-05	5.16E-06	1.64E-05
Notes Ing/Derm - Ingestion/Dermal Contact NC - Not Calculated or no dose-response value NCOPC - Not a constituent of potential concern in this area/medium PCBs - Polychlorinated Biphenyls RME - Reasonable Maximum Exposure SVOCs - Semivolatile Organic Compounds TCDD - TEQ - Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration VOCs - Volatile Organic Compounds														

TABLE 6.6  
TOTAL POTENTIAL HAZARD INDEX  
CONSTRUCTION UTILITY WORKER RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RVFS

Constituent	O					O North					P					Q North				
	Combined Soil		AA-O-1-18		Total HQ	Combined Soil		Leachate		Total HQ	Combined Soil		Total HQ	Combined Soil		Total HQ	Combined Soil		Total HQ	Total HQ
	Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation		
VOCs																				
1,1,2 Trichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,2 Dichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,2 Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2 Butanone (MEK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4 Methyl 2 pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.48E-05	4.70E-05	6.17E-05	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	5.23E-05	1.68E-04
Acetone	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	3.78E-05	NC
Benzene	2.21E-02	3.14E+00	NCOPC	NCOPC	3.16E+00	3.04E-03	4.38E-01	1.39E-02	2.80E-02	4.81E-01	4.94E-05	6.94E-03	6.99E-03	7.10E-05	1.02E-02	6.42E-03	1.20E-02	1.20E-02	2.87E-02	2.87E-02
Chlorobenzene	6.33E-03	9.95E-01	NCOPC	NCOPC	1.00E+00	4.00E-03	5.26E-01	4.72E-03	2.22E-02	6.57E-01	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	3.19E-03	1.50E-02
Chloroform	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	2.80E-04	7.28E-03	NCOPC	NCOPC	7.53E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	8.90E-06	1.49E-05
Ethylbenzene	4.66E-03	2.52E-01	NCOPC	NCOPC	2.56E-01	1.27E-03	8.79E-02	NCOPC	NCOPC	6.91E-02	1.30E-04	7.01E-03	7.14E-03	1.30E-05	6.90E-04	NCOPC	NCOPC	NCOPC	7.03E-04	2.34E-03
Trichloroethene	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.13E-04	2.21E-03	NCOPC	NCOPC	2.32E-03	2.58E-04	5.18E-03	5.41E-03	8.18E-06	1.62E-03	5.34E-04	1.04E-04	NCOPC	NCOPC	NC
Toluene	3.25E-04	1.38E-01	NCOPC	NCOPC	1.35E-01	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Trichloroethylene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	5.49E-04	5.01E-03	5.58E-03	1.14E-04	1.00E-03	1.52E-03	4.04E-04	NCOPC	NCOPC	3.04E-03
Xylenes Total	1.17E-02	1.42E+01	NCOPC	NCOPC	1.43E+01	3.27E-03	3.95E+00	NCOPC	NCOPC	3.95E+00	3.84E-01	3.84E-01	3.84E-01	4.85E-06	5.81E-02	NCOPC	NCOPC	NCOPC	NCOPC	5.81E-02
SVOCs																				
1,2 Dichlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	9.82E-04	1.71E-05	NCOPC	NCOPC	9.79E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,3 Dichlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	2.22E-03	9.86E-08	NCOPC	NCOPC	2.22E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,4 Dichlorobenzene	2.81E-04	3.86E-07	NCOPC	NCOPC	2.81E-04	6.86E-04	9.86E-07	NCOPC	NCOPC	6.87E-04	3.72E-04	5.51E-07	3.72E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2,4,6-Trichlorophenol	1.15E-02	NC	NCOPC	NCOPC	1.15E-02	1.02E-01	NC	2.58E-01	NCOPC	3.67E-01	NCOPC	NCOPC	NC	1.83E-02	NC	6.41E+00	NCOPC	NCOPC	NCOPC	8.43E+00
2,4-Dichlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	3.41E-03	NCOPC	3.41E-03	NCOPC	NCOPC	NC	2.88E-03	NC	1.81E+00	NCOPC	NCOPC	NCOPC	1.82E+00
2,4-Dimethylphenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.59E-04	NCOPC	NCOPC	NCOPC	2.59E-04
2 Chlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.08E-03	NCOPC	1.08E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.58E-02	NCOPC	NCOPC	NCOPC	2.58E-02
2 Methylnaphthalene	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.45E-03	4.38E-04	NCOPC	NCOPC	1.89E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
2 Nitroaniline	NC	8.22E-06	NCOPC	NCOPC	8.22E-06	NC	2.04E-03	NC	NCOPC	2.04E-03	NCOPC	NCOPC	NC	NC	2.03E-04	NC	NCOPC	NCOPC	NCOPC	2.03E-04
3 Methylphenol/4 Methylphenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.92E-04	NCOPC	1.92E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	4.81E-04	NCOPC	NCOPC	NCOPC	4.81E-04
4 Chloroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.07E-02	NCOPC	1.07E-02	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.38E-02	NCOPC	NCOPC	NCOPC	2.38E-02
4 Nitroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	5.86E-02	1.66E-03	1.27E-03	NCOPC	5.84E-02	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.94E-03	NCOPC	NCOPC	NCOPC	1.94E-03
Benzo(a)anthracene	NC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Benzo(a)pyrene	NC	NC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Benzo(b)fluoranthene	NC	NC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Benzo(g,h,i)perylene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Benzo(k)fluoranthene	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
bis(2-Chloroethyl)ether	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
bis(2-Ethylhexyl)phthalate	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
D benzo(a,h)anthracene	NC	NC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Hexachlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	9.54E-04	NC	NCOPC	NCOPC	9.54E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Indeno(1,2,3-cd)pyrene	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Naphthalene	NCOPC	NCOPC	NCOPC	NCOPC	NC	2.97E-04	8.99E-05	2.83E-03	NCOPC	3.01E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	5.53E-03	NCOPC	NCOPC	NCOPC	5.53E-03
Nitrobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	3.66E-03	3.83E-05	1.77E-03	NCOPC	5.47E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.87E-02	NCOPC	NCOPC	NCOPC	2.87E-02
Phenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.18E-04	NCOPC	1.16E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.45E-04	NCOPC	NCOPC	NCOPC	2.45E-04
Pesticides																				
4,4 DDE	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.10E-02	NC	NCOPC	NCOPC	1.10E-02	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
4,4 DDT	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.93E-02	NC	NCOPC	NCOPC	1.93E-02	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Aldrin	4.00E-03	NC	NCOPC	NCOPC	4.00E-03	2.50E-02	NC	NCOPC	NCOPC	2.50E-02	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
alpha BHC	NCOPC	NCOPC	NCOPC	NCOPC	NC	8.32E-04	NC	NCOPC	NCOPC	8.32E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
beta BHC	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.17E-02	NC	1.91E-04	NCOPC	1.18E-02	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.03E-03	NCOPC	NCOPC	NCOPC	1.03E-03
delta BHC	1.58E-03	NC	NCOPC	NCOPC	1.58E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Dieldrin	1.27E-02	NC	NCOPC	NCOPC	1.27E-02	1.66E-01	NC	NCOPC	NCOPC	1.66E-01	9.42E-04	NC	9.42E-04	1.94E-03	NC	NCOPC	NCOPC	NCOPC	NCOPC	1.94E-03
Endrin Ketone	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.44E-04	NCOPC	NCOPC	NCOPC	2.44E-04
gamma BHC (Lindane)	1.60E-03	NC	NCOPC	NCOPC	1.60E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Heptachlor	9.28E-04	NC	NCOPC	NCOPC	9.28E-04	3.30E-03	NC	NCOPC	NCOPC	3.30E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Heptachlor epoxide	8.02E-03	NC	NCOPC	NCOPC	8.02E-03	3.46E-02	NC	NCOPC	NCOPC	3.46E-02	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Herbicides																				
2,4,5 T	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.03E-04	NCOPC	1.03E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
2,4 D	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.21E-03	NCOPC	1.21E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.25E-01	NCOPC	NCOPC	NCOPC	1.25E-01
MCPP	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.75E-02	NC	1.75E-02	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
MCPP	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Pentachloropheno	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.21E-02	NCOPC	2.21E-02	NCOPC	NCOPC	NC	9.09E-04	NC	1.31E-01	NCOPC	NCOPC	NCOPC	1.31E-01

TABLE B-6  
TOTAL POTENTIAL HAZARD INDEX  
CONSTRUCTION/UTILITY WORKER RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RIFS

Constituent	O					O North					P				Q North				
	Combined Soil		AA-O-1-16		Total HQ	Combined Soil		Leachate		Total HQ	Combined Soil		Total HQ		Combined Soil		Leachate		Total HQ
	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation		Ing/Derm.	Inhalation	Ing/Derm.	Inhalation		Ing/Derm.	Inhalation			Ing/Derm.	Inhalation	Ing/Derm.	Inhalation	
PCBs																			
Total PCBs	2.53E+00	NC	NCOPC	NCOPC	2.53E+00	2.57E+01	NC	2.81E+00	NCOPC	2.85E+01	1.43E-01	NC	1.43E-01		4.58E-01	NC	5.34E-02	NCOPC	5.11E-01
Dioxin																			
2,3,7,8-TCDD TEQ	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC
Metals																			
Antimony	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		6.79E-03	NC	1.34E-04	NCOPC	8.92E-03
Arsenic	NCOPC	NCOPC	5.05E-04	NCOPC	5.05E-04	6.92E-03	NC	NCOPC	NCOPC	5.92E-03	2.70E-03	NC	2.70E-03		2.48E-03	NC	NCOPC	NCOPC	2.48E-03
Barium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		6.82E-03	4.07E-02	NCOPC	NCOPC	4.75E-02
Beryllium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.69E-02	NC	NCOPC	NCOPC	1.69E-02	2.81E-03	NC	2.81E-03		3.71E-03	NC	NCOPC	NCOPC	3.71E-03
Chromium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NCOPC	NC
Cobalt	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NCOPC	NC
Copper	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NCOPC	NC
Lead	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NC	NC	NCOPC	NCOPC	NC
Manganese	NCOPC	NCOPC	6.92E-04	NCOPC	6.92E-04	NCOPC	NCOPC	3.04E-03	NCOPC	3.04E-03	NCOPC	NCOPC	NC		NCOPC	NCOPC	3.04E-04	NCOPC	3.04E-04
Mercury	NCOPC	NCOPC	NCOPC	NCOPC	NC	3.84E-01	7.89E-03	NCOPC	NCOPC	3.92E-01	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NCOPC	NC
Nickel	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	1.15E-04	NCOPC	1.15E-04
Thallium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.20E-04	NCOPC	1.20E-04	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NCOPC	NC
Vanadium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NCOPC	NC
Zinc	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	1.37E-04	NCOPC	1.37E-04
Total HQ	2.81E+00	1.88E+01	1.20E-03	NCOPC	2.14E+01	2.68E+01	5.10E+00	3.13E+00	4.82E-02	3.44E+01	1.60E-01	4.08E-01	3.76E-01		6.00E-01	1.28E-01	1.06E+01	3.90E-01	1.17E+01
Notes Ing/Derm - Ingestion/Dermal Contact HI - Hazard Index HQ - Hazard Quotient NC - Not Calculated or no dose-response value NCOPC - Not a constituent of potential concern in this area/medium PCBs - Polychlorinated Biphenyls RME - Reasonable Maximum Exposure SVOCs - Semivolatile Organic Compounds TCDD - Tetrachlorodibenzo-p-dioxin TEQ - Toxic Equivalents Concentration VOCs - Volatile Organic Compounds																			

TABLE 6.6  
TOTAL POTENTIAL HAZARD INDEX  
CONSTRUCTION/UTILITY WORKER RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/F/S

Constituent	Q Central			Q South			R			S				
	Combined Soil		Total HQ	Combined Soil		Total HQ	Combined Soil		Leachate	Total HQ	Combined Soil		Total HQ	
	Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation			Ing/Derm	Inhalation		
VOCs														
1 1 2 Trichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1 32E-04	NC	NCOPC	NCOPC	1 32E-04	NCOPC	NCOPC	NC
1 2 Dichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	2 73E-04	3 13E-02	2 22E-02	8 42E+00	8 48E+00	NCOPC	NCOPC	NC
1 2 Dichloroethane (total)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1 14E-04	NC	9 77E-03	NC	9 88E-03	NCOPC	NCOPC	NC
2 Butanone (MEK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	4 47E-05	5 30E-03	5 35E-03	NCOPC	NCOPC	NC
4 Methyl 2 pentanone (MIBK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	8 32E-04	3 82E-03	4 48E-03	NC
Acetone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	8 64E-04	NC	8 64E-04	NCOPC	NCOPC	NC
Benzene	NCOPC	NCOPC	NC	1 31E-05	1 90E-03	1 91E-03	2 30E-03	8 77E-03	1 92E-01	3 08E-01	1 54E-03	5 64E-03	7 39E-03	NC
Chlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4 90E-03	2 58E-02	3 61E-03	1 89E-02	5 12E-02	9 99E-03	5 34E-02	6 34E-02
Chloroform	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	8 21E-05	4 18E-04	2 72E-03	3 43E-02	3 78E-02	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	3 80E-04	6 01E-04	9 81E-04	1 64E-04	1 57E-04	3 20E-04
Ethylbenzene	NCOPC	NCOPC	NC	5 88E-05	3 17E-03	3 23E-03	2 70E-05	3 39E-05	NCOPC	NCOPC	6 09E-05	1 83E-03	2 30E-03	4 13E-03
Tetrachloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	7 41E-03	2 58E-03	2 13E-01	4 15E-02	2 85E-01	5 49E-04	2 03E-04	7 52E-04
Toluene	NCOPC	NCOPC	NC	1 41E-04	5 77E-02	5 78E-02	2 62E-04	2 75E-03	8 38E-03	4 08E-02	5 02E-02	4 99E-03	5 22E-02	5 72E-02
Trichloroethylene	NCOPC	NCOPC	NC	2 86E-05	2 54E-04	2 82E-04	1 22E+00	7 20E-01	1 14E+01	3 03E+00	1 64E+01	1 33E-01	7 83E-02	2 11E-01
Xylenes Total	NCOPC	NCOPC	NC	2 11E-04	2 52E-01	2 52E-01	7 44E-05	2 30E-03	NCOPC	NCOPC	2 38E-03	6 11E-03	1 86E-01	1 92E-01
SVOCs														
1 2 Dichlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
1 3-Dichlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	2 22E-03	9 88E-08	2 22E-03
1 4 Dichlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	3 56E-05	5 28E-08	NCOPC	NCOPC	3 57E-05	1 11E-03	1 04E-06	1 11E-03
2 4 6-Trichlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	2 83E-01	NC	NCOPC	NCOPC	2 83E-01	1 37E-02	NC	1 37E-02
2 4 Dichlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4 70E-02	NC	NCOPC	NCOPC	4 70E-02	NCOPC	NCOPC	NC
2 4 Dimethylphenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2 Chlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	3 17E-03	NC	3 59E-02	NCOPC	3 91E-02	NCOPC	NCOPC	NC
2-Methylnaphthalene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2 Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	9 24E-05	NCOPC	NCOPC	9 24E-05	NC	1 51E-04	1 51E-04
3 Methylphenol/4 Methylphenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1 35E-03	NCOPC	1 35E-03	NCOPC	NCOPC	NC
4 Chloroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1 07E-01	NCOPC	1 07E-01	NCOPC	NCOPC	NC
4 Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4 83E-04	1 37E-05	3 28E-02	NCOPC	3 30E-02	3 16E-03	9 39E-05	3 26E-03
Benzo(a)anthracene	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
Benzo(a)pyrene	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
Benzo(b)fluoranthene	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
Benzo(g,h,i)perylene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	3 28E-01	NCOPC	3 28E-01	NCOPC	NCOPC	NC
Benzo(k)fluoranthene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
bis(2-Chloroethyl)ether	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
bis(2-Ethylhexyl)phthalate	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	1 04E-03	NC	1 04E-03
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
Hexachlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Indeno(1 2 3 cd)pyrene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Naphthalene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	2 13E-04	6 44E-05	NCOPC	NCOPC	2 77E-04	3 47E-04	1 05E-04	4 53E-04
Nitrobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4 83E-03	4 78E-05	NCOPC	NCOPC	4 88E-03	NCOPC	NCOPC	NC
Phenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	3 35E-02	NCOPC	3 35E-02	NCOPC	NCOPC	NC
Pesticides														
4 4 DDE	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4 4 DDT	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	2 37E-01	NCOPC	2 37E-01	5 33E-03	NC	5 33E-03
Aldrin	1 89E-04	NC	1 89E-04	3 78E-04	NC	3 78E-04	NCOPC	NCOPC	NCOPC	NCOPC	NC	1 08E-03	NC	1 08E-03
alpha BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
beta BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4 18E-04	NC	1 52E-02	NCOPC	1 57E-02	1 44E-02	NC	1 44E-02
delta BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Dieldrin	4 89E-04	NC	4 89E-04	1 88E-03	NC	1 88E-03	4 08E-03	NC	8 89E-02	NCOPC	9 10E-02	1 27E-03	NC	1 27E-03
Endrin Ketone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
gamma BHC (Lindane)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1 89E-03	NCOPC	1 89E-03	4 18E-03	NC	4 18E-03
Heptachlor	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1 48E-04	NC	6 88E-03	NCOPC	7 01E-03	4 99E-04	NC	4 99E-04
Heptachlor epoxide	NCOPC	NCOPC	NC	1 32E-03	NC	1 32E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Herbicides														
2 4 5 T	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2 4 D	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	4 94E-03	NCOPC	4 94E-03	NCOPC	NCOPC	NC
MCPA	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
MCPP	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1 03E-02	NC	NCOPC	NCOPC	1 03E-02	NCOPC	NCOPC	NC
Pentachlorophenol	3 62E-05	NC	3 62E-05	4 30E-04	NC	4 30E-04	NCOPC	NCOPC	NCOPC	NCOPC	NC	2 44E-03	NC	2 44E-03

TABLE 6-6  
TOTAL POTENTIAL HAZARD INDEX  
CONSTRUCTION/UTILITY WORKER - RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RUFFS

Constituent	Q Central			Q South			R				S			
	Combined Soil		Total HQ	Combined Soil		Total HQ	Combined Soil		Leachate		Total HQ	Combined Soil		Total HQ
	Ing/Derm.	Inhalation		Ing/Derm.	Inhalation		Ing/Derm.	Inhalation	Ing/Derm.	Inhalation				
PCBs														
Total PCBs	3.69E-02	NC	3.69E-02	1.61E-01	NC	1.61E-01	7.54E-01	NC	2.04E+02	NCOPC	2.04E+02	6.56E+00	NC	6.56E+00
Dioxin														
2,3,7,8-TCDD-TEQ	NC	NC	NC	NC	NC	NC	NC	NC	NC	NCOPC	NC	NC	NC	NC
Metals														
Antimony	NCOPC	NCOPC	NC	7.64E-03	NC	7.64E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Arsenic	3.55E-03	NC	3.55E-03	2.75E-03	NC	2.75E-03	1.17E-03	NC	NCOPC	NCOPC	1.17E-03	NCOPC	NCOPC	NC
Barium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Beryllium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	3.54E-04	NCOPC	3.54E-04	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Chromium	NCOPC	NCOPC	NC	2.04E-03	8.54E-03	1.06E-02	NCOPC	NCOPC	7.36E-03	NCOPC	7.36E-03	7.51E-03	3.15E-02	3.90E-02
Cobalt	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	3.22E-04	NCOPC	3.22E-04	NCOPC	NCOPC	NC
Copper	2.75E-02	NC	2.75E-02	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Lead	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
Manganese	6.95E-03	1.70E-01	1.79E-01	6.92E-03	1.12E-01	1.18E-01	NCOPC	NCOPC	4.22E-02	NCOPC	4.22E-02	NCOPC	NCOPC	NC
Mercury	NCOPC	NCOPC	NC	3.82E-03	7.85E-05	3.90E-03	7.46E-01	1.53E-02	1.47E-03	NCOPC	7.83E-01	NCOPC	NCOPC	NC
Nickel	NCOPC	NCOPC	NC	6.09E-03	NC	5.09E-03	NCOPC	NCOPC	6.70E-04	NCOPC	6.70E-04	NCOPC	NCOPC	NC
Thallium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	3.90E-03	NCOPC	3.90E-03	NCOPC	NCOPC	NC
Vanadium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.08E-04	NCOPC	2.08E-04	NCOPC	NCOPC	NC
Zinc	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.82E-03	NCOPC	1.82E-03	NCOPC	NCOPC	NC
Total HQ	7.76E-02	1.70E-01	2.47E-01	1.93E-01	4.38E-01	6.29E-01	3.09E+00	6.10E-01	2.18E+02	1.18E+01	2.32E+02	6.77E+00	4.14E-01	9.19E+00
Notes														
Ing/Derm - Ingestion/Dermal Contact														
HI - Hazard Index														
HQ - Hazard Quotient														
NC - Not Calculated or no dose-response value														
NCOPC - Not a constituent of potential concern in this area/medium														
PCBs - Polychlorinated Biphenyls														
RME - Reasonable Maximum Exposure														
SVOCs - Semivolatile Organic Compounds														
TCDD - TEQ - Tetrachlorodibenzo-p-dioxin														
Toxic Equivalents Concentration														
VOCs - Volatile Organic Compounds														

TABLE 6-7  
TOTAL POTENTIAL CARCINOGENIC RISK  
TRESPASSING TEENAGER - RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RIFS

Constituent	O				O North				P			Q North				Q Central		
	Surface Soil		AA-O-1-18	Total	Surface Soil		Leachate	Total	Surface Soil		Total	Surface Soil		Leachate	Total	Surface Soil		Total
	Ing/Derm	Inhalation	Inhalation	Risk	Ing/Derm	Inhalation	Inhalation	Risk	Ing/Derm	Inhalation	Risk	Ing/Derm	Inhalation	Inhalation	Risk	Ing/Derm	Inhalation	Risk
<b>VOCs</b>																		
1,1,2-Trichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
1,2-Dichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	4.42E-09	5.20E-09	9.62E-09	NCOPC	NCOPC	NC
1,2-Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Acetone	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Benzene	NCOPC	1.54E-07	NCOPC	1.54E-07	NCOPC	2.90E-08	3.90E-10	2.94E-08	NCOPC	9.68E-10	9.68E-10	NCOPC	8.38E-10	1.72E-10	1.01E-09	NCOPC	NCOPC	NC
Chlorobenzene	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Chloroform	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	7.80E-09	NCOPC	7.80E-09	NCOPC	NCOPC	NC	NCOPC	NCOPC	3.01E-12	3.01E-12	NCOPC	NCOPC	NC
Ethylbenzene	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Tetrachloroethene	NCOPC	NCOPC	NCOPC	NC	NCOPC	7.80E-09	NCOPC	7.80E-09	NCOPC	3.60E-08	3.60E-08	NCOPC	6.72E-08	1.80E-10	8.90E-09	NCOPC	NCOPC	NC
Toluene	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Trichloroethylene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	4.34E-08	4.34E-08	NCOPC	5.49E-09	1.99E-08	7.48E-09	NCOPC	NCOPC	NC
Xylenes, Total	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
<b>SVOCs</b>																		
2,4,6-Trichloropheno	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2,4-Dichloropheno	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2-Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4-Chloroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4-Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Benzo(a)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Benzo(a)pyrene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	3.81E-08	1.82E-12	3.81E-08	1.02E-07	4.35E-12	NCOPC	1.02E-07	NCOPC	NCOPC	NC
Benzo(b)fluoranthene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Dibenz(a,h)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	2.11E-08	8.94E-13	NCOPC	2.11E-08	NCOPC	NCOPC	NC
<b>Pesticides</b>																		
4,4-DDT	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
beta-BHC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Dieldrin	8.99E-08	2.28E-12	NCOPC	8.99E-08	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Heptachlor	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
<b>Herbicides</b>																		
MCPA	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
MCPP	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Pentachloropheno	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
<b>PCBs</b>																		
Total PCBs	4.65E-07	1.68E-11	NCOPC	4.65E-07	3.08E-06	7.35E-10	NCOPC	3.08E-06	3.03E-07	1.09E-11	3.03E-07	8.06E-08	2.91E-12	NCOPC	8.06E-08	1.11E-07	4.01E-12	1.11E-07
Dioxin																		
2,3,7,8-TCDD-TEQ	1.01E-05	3.81E-10	NCOPC	1.01E-05	8.82E-05	2.17E-09	NCOPC	8.82E-05	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	5.61E-08	2.13E-10	5.61E-08
<b>Metals</b>																		
Antimony	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Arsenic	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	2.80E-07	3.06E-10	2.81E-07	NCOPC	NCOPC	NCOPC	NC	1.40E-07	1.53E-10	1.40E-07
Cadmium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	4.52E-10	NCOPC	4.52E-10	NCOPC	NCOPC	NC
Chromium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Lead	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Manganese	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Mercury	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
<b>Total</b>	1.08E-05	1.54E-07	NC	1.07E-05	1.17E-04	4.78E-08	3.98E-10	1.17E-04	6.21E-07	8.07E-08	7.02E-07	2.04E-07	1.70E-08	7.35E-09	2.30E-07	5.86E-08	3.70E-10	5.86E-08
<b>Notes</b> Ing/Derm: Ingestion/Dermal Contact NC: Not Calculated or no dose-response value NCOPC: Not a constituent of potential concern in this area/medium PCBs: Polychlorinated Biphenyls RME: Reasonable Maximum Exposure SVOCs: Semivolatile Organic Compounds TCDD - TEQ: Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration VOCs: Volatile Organic Compounds																		

TABLE 6.7  
TOTAL POTENTIAL CARCINOGENIC RISK  
TRESPASSING TEENAGER RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RIFS

Constituent	Q South					R						S			River			
	Surface Soil		AA-Q-4-24		Total Risk	Surface Soil		AA-R-1-23		Leachate	Max Value	Total Risk	Surface Soil		Total Risk	Surface Water		Total HQ
	Ing/Derm	Inhalation	Inhalation	Ing/Derm		Ing/Derm	Inhalation	Inhalation	Inhalation				Ing/Derm	Inhalation		Ing/Derm	Inhalation	
VOCs																		
1,1,2 Trichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	1.60E-09	NCOPC	NCOPC	NC	NC	1.60E-09	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
1,2 Dichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	1.51E-08	NCOPC	1.04E-07	1.04E-07	1.19E-07	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
1,2 Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
2 Butanone (MEK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
4 Methyl-2 pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC
Acetone	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Benzene	NCOPC	1.50E-10	1.78E-10	NCOPC	3.28E-10	NCOPC	2.11E-09	7.92E-13	2.51E-09	2.51E-09	4.62E-09	NCOPC	1.41E-09	1.41E-09	NCOPC	NCOPC	NC	NC
Chlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC
Chloroform	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	1.18E-08	NCOPC	4.25E-09	4.25E-09	5.44E-09	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Chloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	6.12E-14	NCOPC	6.12E-14	6.12E-14	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Dichloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	1.03E-10	1.03E-10	1.03E-10	NCOPC	8.09E-10	8.09E-10	NCOPC	NCOPC	NC	NC
Ethylbenzene	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC
Tetrachloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	3.48E-08	NCOPC	6.72E-08	6.72E-08	1.02E-07	NCOPC	2.52E-09	2.52E-09	NCOPC	NCOPC	NC	NC
Toluene	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC
Trichloroethylene	NCOPC	1.35E-09	NCOPC	NCOPC	1.35E-09	NCOPC	1.03E-05	NCOPC	1.17E-05	1.17E-05	2.19E-05	NCOPC	1.14E-06	1.14E-06	NCOPC	NCOPC	NC	NC
Xylenes Total	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC
SVOCs																		
2,4,6-Trichloropheno	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.19E-09	8.93E-14	2.19E-09	NCOPC	NCOPC	NC	NC
2,4 Dichloropheno	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
2 Nitroanisole	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NC
4 Chloroanisole	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
4 Nitroanisole	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NC
Benzol(a)anthracene	5.98E-09	2.48E-13	NCOPC	NCOPC	5.98E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	4.55E-08	1.93E-12	4.55E-08	NCOPC	NCOPC	NC	NC
Benzol(a)pyrene	5.98E-08	2.54E-12	NCOPC	NCOPC	5.98E-08	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	3.07E-07	1.30E-11	3.07E-07	NCOPC	NCOPC	NC	NC
Benzol(b)fluoranthene	7.88E-09	3.28E-13	NCOPC	NCOPC	7.88E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	3.78E-08	1.59E-12	3.78E-08	NCOPC	NCOPC	NC	NC
Benzo(a,h)anthracene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.02E-07	4.35E-12	1.02E-07	NCOPC	NCOPC	NC	NC
Pesticides																		
4,4 DDT	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.32E-07	4.23E-12	1.32E-07	NCOPC	NCOPC	NC	NC
beta BHC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.14E-06	3.78E-11	1.14E-06	NCOPC	NCOPC	NC	NC
Dieldrin	1.04E-07	3.37E-12	NCOPC	NCOPC	1.04E-07	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
gamma BHC (Lindane)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.37E-07	NC	2.37E-07	NCOPC	NCOPC	NC	NC
Heptachlor	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.64E-07	5.32E-12	1.64E-07	NCOPC	NCOPC	NC	NC
Herbicides																		
MCPA	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
MCPB	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Pentachloropheno	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.28E-06	NC	1.28E-06	NCOPC	NCOPC	NC	NC
PCBs																		
Total PCBs	2.20E-07	7.95E-12	NCOPC	NCOPC	2.20E-07	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	4.35E-05	1.57E-09	4.35E-05	NCOPC	NCOPC	NC	NC
Dioxin																		
2,3,7,8 TCDD TEQ	2.87E-06	1.09E-10	NCOPC	NCOPC	2.87E-06	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Metals																		
Antimony	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Arsenic	1.46E-07	1.58E-10	NCOPC	NCOPC	1.46E-07	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.19E-08	2.19E-08
Cadmium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Chromium	NC	5.92E-09	NCOPC	NCOPC	5.92E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Lead	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Manganese	NC	NC	NCOPC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Mercury	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Total	3.41E-06	1.70E-09	1.78E-10	NC	3.42E-06	NC	1.03E-05	8.93E-13	1.18E-06	1.18E-06	2.22E-05	4.69E-06	1.15E-06	4.61E-06	NC	2.19E-08	2.19E-08	
Notes																		
Ing/Derm: Ingestion/Dermal Contact																		
NC: Not Calculated or no dose-response value																		
NCOPC: Not a constituent of potential concern in this area/medium																		
PCBs: Polychlorinated Biphenyls																		
RME: Reasonable Maximum Exposure																		
SVOCs: Semivolatile Organic Compounds																		
TCDD TEQ: Tetrachlorodibenzo-p-dioxin																		
Toxic Equivalents Concentration																		
VOCs: Volatile Organic Compounds																		

TABLE 6.8  
TOTAL POTENTIAL HAZARD INDEX  
TRESPASSING TEENAGER RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/F5

Constituent	O				O North				P				Q North				Q Central			
	Surface Soil		AA-O-1-16		Surface Soil		Leachate		Surface Soil		Total		Surface Soil		Leachate		Surface Soil		Total	
	Ing/Derm	Inhalation	Inhalation	Total HQ	Ing/Derm	Inhalation	Inhalation	Total HQ	Ing/Derm	Inhalation	Total HQ		Ing/Derm	Inhalation	Inhalation	Total HQ	Ing/Derm	Inhalation	Total HQ	
VOCs																				
1,2 Trichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
1,2 Dichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
1,2 Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
2 Butanone (MEK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
4 Methyl-2 pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.57E-07	1.57E-07	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	2.08E-07	2.08E-07	NCOPC	NCOPC	NC
Acetone	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Benzene	NCOPC	1.49E-02	NCOPC	1.49E-02	NCOPC	2.80E-03	3.82E-05	2.84E-03	NCOPC	9.34E-05	9.34E-05		NCOPC	8.08E-05	1.06E-05	9.72E-05	NCOPC	NCOPC	NC	
Chlorobenzene	NCOPC	1.11E-02	NCOPC	1.11E-02	NCOPC	9.84E-03	2.57E-05	9.87E-03	NCOPC	NCOPC	NC		NCOPC	NCOPC	1.54E-05	1.54E-05	NCOPC	NCOPC	NC	
Chloroform	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Chloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Dichloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	3.51E-05	NCOPC	3.51E-05	NCOPC	NCOPC	NC		NCOPC	NCOPC	1.35E-08	1.35E-08	NCOPC	NCOPC	NC	
Ethylbenzene	NCOPC	2.42E-03	NCOPC	2.42E-03	NCOPC	9.18E-04	NCOPC	9.18E-04	NCOPC	1.85E-04	1.85E-04		NCOPC	1.13E-05	NCOPC	1.13E-05	NCOPC	NCOPC	NC	
Tetrachloroethene	NCOPC	NCOPC	NCOPC	NC	NCOPC	1.39E-05	NCOPC	1.39E-05	NCOPC	8.42E-05	8.42E-05		NCOPC	1.20E-06	3.21E-07	1.23E-06	NCOPC	NCOPC	NC	
Toluene	NCOPC	8.81E-04	NCOPC	8.81E-04	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Trichloroethylene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	8.91E-05	8.91E-05		NCOPC	8.73E-06	3.16E-06	1.19E-05	NCOPC	NCOPC	NC	
Xylenes Total	NCOPC	1.23E-01	NCOPC	1.23E-01	NCOPC	4.71E-02	NCOPC	4.71E-02	NCOPC	8.91E-03	8.91E-03		NCOPC	8.53E-04	NCOPC	8.53E-04	NCOPC	NCOPC	NC	
SVOCs																				
2,4,6 Trichloropheno	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
2,4 Dichloropheno	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
2 Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
4 Chloroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
4 Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Benzo(a)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Benzo(a)pyrene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC		NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Benzo(b)fluoranthene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Dibenz(a,h)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Pesticides																				
4,4 DDT	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
beta BHC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Dieldrin	5.58E-04	NC	NCOPC	5.58E-04	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
gamma-BHC (Lindane)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Heptachlor	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Herbicides																				
MCPA	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
MCPB	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Pentachloropheno	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
PCBs																				
Total PCBs	7.40E-02	NC	NCOPC	7.40E-02	4.88E+00	NC	NCOPC	4.88E+00	4.81E-02	NC	4.81E-02		1.28E-02	NC	NCOPC	1.28E-02	1.77E-02	NC	1.77E-02	
Dioxin																				
2,3,7,8 TCDD TEQ	NC	NC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	
Metals																				
Antimony	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Arsenic	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	3.97E-03	NC	3.97E-03		NCOPC	NCOPC	NCOPC	NC	1.98E-03	NC	1.98E-03	
Cadmium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		1.50E-02	NC	NCOPC	1.50E-02	NCOPC	NCOPC	NC	
Chromium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Lead	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Manganese	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Mercury	NCOPC	NCOPC	NCOPC	NC	4.37E-02	1.65E-06	NCOPC	4.37E-02	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Total HQ	7.40E-02	1.53E-01	NC	2.27E-01	4.88E+00	8.07E-02	8.40E-05	4.97E+00	5.21E-02	8.30E-03	8.10E-02		2.78E-02	1.18E-03	2.95E-04	2.63E-02	1.98E-02	NC	1.98E-02	
Notes																				
Ing/Derm Ingestion/Dermal Contact																				
HI Hazard Index																				
HQ Hazard Quotient																				
NC Not Calculated or no dose-response value																				
NCOPC Not a constituent of potential concern in this area/medium																				
PCBs Polychlorinated Biphenyls																				
RME Reasonable Maximum Exposure																				
SVOCs Semivolatile Organic Compounds																				
TCDD TEQ Tetrachlorodibenzo-p dioxin																				
VOCs Volatile Organic Compounds																				

TABLE 5-8  
TOTAL POTENTIAL HAZARD INDEX  
TRESPASSING TEENAGER RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RIFS

Constituent	Q South					R					S					River		
	Surface Soil		AA-Q-4-24	Pond SW	Total	Surface Soil		AA-R-1-28	Leachate	Max Value	Total	Surface Soil		Total	Surface Water		Sediment	Total
	Ing/Derm	Inhalation	Inhalation	Ing/Derm	HQ	Ing/Derm	Inhalation	Inhalation	Inhalation	Inhalation	HQ	Ing/Derm	Inhalation	HQ	Ing/Derm	Inhalation	Ing/Derm	HQ
VOCs																		
1,1,2-Trichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,2-Dichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	7.53E-04	NCOPC	5.20E-03	5.20E-03	5.95E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,2-Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	9.29E-07	9.29E-07	9.29E-07	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	8.49E-05	8.49E-05	NCOPC	NCOPC	NCOPC	NC
Acetone	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Benzene	NCOPC	1.44E-05	1.70E-05	NCOPC	3.14E-05	NCOPC	2.04E-04	7.84E-08	2.42E-04	2.42E-04	4.49E-04	NCOPC	1.30E-04	1.30E-04	NCOPC	NCOPC	NCOPC	NC
Chlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	5.99E-04	1.24E-07	1.59E-05	1.59E-05	6.15E-04	NCOPC	1.24E-03	1.24E-03	NCOPC	NCOPC	NCOPC	NC
Chloroform	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	9.82E-08	NCOPC	3.59E-05	3.59E-05	4.55E-05	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.40E-09	NCOPC	2.40E-09	2.40E-09	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	4.65E-07	4.65E-07	4.65E-07	NCOPC	3.64E-06	3.64E-06	NCOPC	NCOPC	NCOPC	NCOPC	NC
Ethylbenzene	NCOPC	5.21E-05	NCOPC	NCOPC	5.21E-05	NCOPC	7.89E-07	NCOPC	NCOPC	NC	7.89E-07	NCOPC	5.34E-05	5.34E-05	NCOPC	NCOPC	NCOPC	NC
Tetrachloroethene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	6.21E-05	NCOPC	1.20E-04	1.20E-04	1.82E-04	NCOPC	4.49E-06	4.49E-06	NCOPC	NCOPC	NCOPC	NC
Toluene	NCOPC	6.08E-04	NCOPC	NCOPC	6.08E-04	NCOPC	6.38E-05	NCOPC	6.08E-05	6.08E-05	1.24E-04	NCOPC	1.24E-03	1.24E-03	NCOPC	NCOPC	NCOPC	NC
Trichloroethylene	NCOPC	2.15E-06	NCOPC	NCOPC	2.15E-06	NCOPC	1.84E-02	NCOPC	1.86E-02	1.86E-02	3.49E-02	NCOPC	1.82E-03	1.82E-03	NCOPC	NCOPC	NCOPC	NC
Xylenea Total	NCOPC	3.69E-03	NCOPC	NCOPC	3.69E-03	NCOPC	5.35E-06	NCOPC	NCOPC	NC	5.35E-06	NCOPC	4.46E-03	4.46E-03	NCOPC	NCOPC	NCOPC	NC
SVOCs																		
2,4,6-Trichloropheno	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.27E-02	NC	1.27E-02	NCOPC	NCOPC	NCOPC	NC
2,4-Dichloropheno	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC	3.28E-04	NCOPC	NCOPC	3.25E-04
2-Nitroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	3.99E-07	3.99E-07	NCOPC	NCOPC	NCOPC	NC
4-Chloroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	1.55E-04	NCOPC	NCOPC	1.55E-04
4-Nitroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.93E-03	2.48E-07	2.93E-03	NCOPC	NCOPC	NCOPC	NC
Benzo(a)anthracene	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(a)pyrene	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(b)fluoranthene	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC
Pesticides																		
4,4 DDT	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	4.94E-03	NC	4.94E-03	NCOPC	NCOPC	NCOPC	NC
beta BHC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.34E-02	NC	1.34E-02	NCOPC	NCOPC	NCOPC	NC
Dieldrin	8.31E-04	NC	NCOPC	NCOPC	8.31E-04	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
gamma BHC (Lindane)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	3.88E-03	NC	3.88E-03	NCOPC	NCOPC	NCOPC	NC
Heptachlor	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	4.63E-04	NC	4.63E-04	NCOPC	NCOPC	NCOPC	NC
Herbicides																		
MCPA	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	6.78E-03	NCOPC	NCOPC	6.78E-03
MCPP	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	3.97E-03	NCOPC	NCOPC	3.97E-03
Pentachloropheno	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.26E-03	NC	2.26E-03	NCOPC	NCOPC	NCOPC	NC
PCBs																		
Total PCBs	3.50E-02	NC	NCOPC	NCOPC	3.50E-02	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	6.91E+00	NC	6.91E+00	NCOPC	NCOPC	NCOPC	NC
Dioxin																		
2,3,7,8-TCDD TEQ	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Metals																		
Antimony	5.49E-03	NC	NCOPC	NCOPC	5.49E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Arsenic	2.08E-03	NC	NCOPC	NCOPC	2.08E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	3.10E-04
Cadmium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Chromium	2.74E-03	3.14E-05	NCOPC	NCOPC	2.77E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Lead	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Manganese	5.53E-03	2.99E-04	NCOPC	2.13E-04	6.04E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Mercury	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Total HQ	5.18E-02	4.70E-03	1.70E-05	2.13E-04	5.65E-02	NC	1.81E-02	2.03E-07	2.42E-02	2.42E-02	4.23E-02	6.95E+00	9.04E-03	6.95E+00	1.12E-02	3.10E-04	1.15E-02	
Notes	<p>Ing/Derm - Ingestion/Dermal Contact  HI - Hazard Index  HQ - Hazard Quotient  NC - Not Calculated or no dose-response value  NCOPC - Not a constituent of potential concern in this area/medium  PCBs - Polychlorinated Biphenyls  RME - Reasonable Maximum Exposure  SVOCs - Semivolatile Organic Compounds  TCDD TEQ - Tetrachlorodibenzo-p-dioxin  Toxic Equivalents Concentration  VOCs - Volatile Organic Compounds</p>																	

TABLE 6-9  
TOTAL POTENTIAL CARCINOGENIC RISK  
RECREATIONAL FISHER RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RVFS

Constituent	Mississippi River - UDA				Mississippi River - PDA				Mississippi River - DDA				Pond (Site Q South)			Pond (Site Q South)		
	Buffalo Fillet	SW	Sediment	Total	Buffalo Fillet	SW	Sediment	Total	Buffalo Fillet	SW	Sediment	Total	Black Bullhead Fillet	SW	Total	Carp Fillet	SW	Total
	Ingestion	Ing/Derm	Ing/Derm	Risk	Ingestion	Ing/Derm	Ing/Derm	Risk	Ingestion	Ing/Derm	Ing/Derm	Risk	Ingestion	Ing/Derm	HQ	Ingestion	Ing/Derm	HQ
<b>SVOs</b>																		
2,4-Dichlorophenol	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4-Chloroaniline	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Benzo(a)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	5.01E-06	NCOPC	5.01E-06
Benzo(a)pyrene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	6.44E-05	NCOPC	6.44E-05
bis(2-Ethylhexyl)phthalate	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	3.43E-07	NCOPC	3.43E-07
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	5.01E-05	NCOPC	5.01E-05
<b>Pesticides</b>																		
4'-DDE	2.83E-07	NCOPC	NCOPC	2.83E-07	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4'-DDT	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	6.00E-06	NCOPC	6.00E-06	5.50E-06	NCOPC	5.50E-06
alpha-Chlordane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	1.71E-07	NCOPC	1.71E-07	2.74E-07	NCOPC	2.74E-07
beta-BHC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1.50E-06	NCOPC	1.50E-06
Dieldrin	6.35E-06	NCOPC	NCOPC	6.35E-06	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	7.84E-05	NCOPC	7.84E-05	1.49E-04	NCOPC	1.49E-04
<b>Herbicides</b>																		
MCPA	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
MCPP	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
<b>PCBs</b>																		
Total PCBs	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	3.79E-04	NCOPC	3.79E-04	9.80E-04	NCOPC	9.80E-04
Dioxin																		
2,3,7,8-TCDD TEQ	3.36E-05	NCOPC	NCOPC	3.36E-05	4.59E-06	NCOPC	NCOPC	4.59E-06	5.43E-06	NCOPC	NCOPC	5.43E-06	2.82E-05	NCOPC	2.82E-05	1.35E-04	NCOPC	1.35E-04
<b>Metals</b>																		
Arsenic	NCOPC	NCOPC	6.97E-08	6.97E-08	NCOPC	NCOPC	6.97E-08	6.97E-08	NCOPC	NCOPC	6.97E-08	6.97E-08	5.73E-05	NCOPC	5.73E-05	6.02E-05	NCOPC	6.02E-05
Lead	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NC
Manganese	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NC
Mercury	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC	NCOPC	NC
<b>Total</b>	<b>4.02E-05</b>	<b>NC</b>	<b>6.97E-08</b>	<b>4.03E-05</b>	<b>4.59E-06</b>	<b>NC</b>	<b>6.97E-08</b>	<b>4.60E-06</b>	<b>5.43E-06</b>	<b>NC</b>	<b>6.97E-08</b>	<b>5.50E-06</b>	<b>5.49E-04</b>	<b>NC</b>	<b>5.49E-04</b>	<b>1.45E-03</b>	<b>NC</b>	<b>1.45E-03</b>

## Notes

Ing/Derm: Ingestion/Dermal Contact

DDA - Downstream Discharge Area (Mississippi River)

NC - Not Calculated or no dose-response value

NCOPC - Not a constituent of potential concern in this area/medium

PCBs - Polychlorinated Biphenyls

PDA - Plume Discharge Area (Mississippi River)

RME - Reasonable Maximum Exposure

SVOs - Semivolatile Organic Compounds

SW - Surface Water

TCDD TEQ - Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration

UDA - Upstream Discharge Area (Mississippi River)

TABLE 6.10  
TOTAL POTENTIAL HAZARD INDEX  
RECREATIONAL FISHER RME  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RIFS

Constituent	Mississippi River - UDA				Mississippi River - PDA				Mississippi River - DDA				Pond (Site Q South)			Pond (Site Q South)		
	Buffalo Fillet	SW	Sediment	Total	Buffalo Fillet	SW	Sediment	Total	Buffalo Fillet	SW	Sediment	Total	Black Bullhead Fillet	SW	Total	Carp Fillet	SW	Total
	Ingestion	Ing/Derm	Ing/Derm	Risk	Ingestion	Ing/Derm	Ing/Derm	Risk	Ingestion	Ing/Derm	Ing/Derm	Risk	Ingestion	Ing/Derm	HQ	Ingestion	Ing/Derm	HQ
<b>SVOCs</b>																		
2,4-Dichlorophenol	NCOPC	4.35E-04	NCOPC	4.35E-04	NCOPC	4.35E-04	NCOPC	4.35E-04	NCOPC	4.35E-04	NCOPC	4.35E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4-Chlorophenol	NCOPC	2.21E-04	NCOPC	2.21E-04	NCOPC	2.21E-04	NCOPC	2.21E-04	NCOPC	2.21E-04	NCOPC	2.21E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Benzo(a)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC
Benzo(a)pyrene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC
bis(2-Ethylhexyl)phthalate	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	2.86E-03	NCOPC	2.86E-03
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC
<b>Pesticides</b>																		
4,4-DDE	3.89E-03	NCOPC	NCOPC	3.89E-03	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4,4-DDT	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	6.23E-02	NCOPC	6.23E-02	7.54E-02	NCOPC	7.54E-02
alpha-Chlordane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	2.29E-03	NCOPC	2.29E-03	3.86E-03	NCOPC	3.86E-03
beta-BHC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	6.48E-03	NCOPC	6.48E-03
Dieldrin	1.85E-02	NCOPC	NCOPC	1.85E-02	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	2.29E-01	NCOPC	2.29E-01	4.34E-01	NCOPC	4.34E-01
<b>Herbicides</b>																		
MCPA	NCOPC	9.09E-03	NCOPC	9.09E-03	NCOPC	9.09E-03	NCOPC	9.09E-03	NCOPC	9.09E-03	NCOPC	9.09E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
MCPP	NCOPC	5.39E-03	NCOPC	5.39E-03	NCOPC	5.39E-03	NCOPC	5.39E-03	NCOPC	5.39E-03	NCOPC	5.39E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
<b>PCBs</b>																		
Total PCBs	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	2.21E+01	NCOPC	2.21E+01	5.71E+01	NCOPC	5.71E+01
Dioxin																		
2,3,7,8-TCDD TEQ	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC	NCOPC	NC
<b>Metals</b>																		
Arsenic	NCOPC	NCOPC	3.62E-04	3.62E-04	NCOPC	NCOPC	3.62E-04	3.62E-04	NCOPC	NCOPC	3.62E-04	3.62E-04	2.97E-01	NCOPC	2.97E-01	3.12E-01	NCOPC	3.12E-01
Lead	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NC
Manganese	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	3.48E-04	3.48E-04	NCOPC	3.48E-04	3.48E-04
Mercury	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	1.90E-01	NCOPC	1.90E-01	6.41E-02	NCOPC	6.41E-02
<b>Total HI</b>	<b>2.24E-02</b>	<b>1.51E-02</b>	<b>3.62E-04</b>	<b>3.79E-02</b>	<b>NC</b>	<b>1.51E-02</b>	<b>3.62E-04</b>	<b>1.58E-02</b>	<b>NC</b>	<b>1.51E-02</b>	<b>3.62E-04</b>	<b>1.58E-02</b>	<b>2.29E+01</b>	<b>3.48E-04</b>	<b>2.29E+01</b>	<b>5.80E+01</b>	<b>3.48E-04</b>	<b>5.80E+01</b>
<b>Notes</b> Ing/Derm Ingestion/Dermal Contact HI Hazard Index HQ Hazard Quotient DDA Downstream Discharge Area (Mississippi River) NC Not Calculated or no dose-response value NCOPC Not a constituent of potential concern in this area/medium PCBs Polychlorinated Biphenyls PDA Plume Discharge Area (Mississippi River) RME Reasonable Maximum Exposure SVOCs Semivolatile Organic Compounds SW Surface Water TCDD TEQ Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration UDA Upstream Discharge Area (Mississippi River)																		

TABLE 6-11  
 TOTAL POTENTIAL CARCINOGENIC RISK  
 INDOOR INDUSTRIAL WORKER - MLE  
 HUMAN HEALTH RISK ASSESSMENT  
 SAUGET AREA 2 RI/FS

Constituent	O	O North	Q North	Q South	R	
	AA-O-1-16 (a)	Leachate L-O-1	Leachate L-Q-1	AA-Q-6-24 (b)	AA-R-1-28 (b)	Leachate L-R-1
	Inhalation Risk	Inhalation Risk	Inhalation Risk	Inhalation Risk	Inhalation Risk	Inhalation Risk
<b>VOCs</b>						
1,2-Dichloroethane	NCOPC	NCOPC	5.25E-09	NCOPC	NCOPC	3.37E-10
1,2-Dichloroethene (total)	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NC	NC	NCOPC	NCOPC	NCOPC
Acetone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Benzene	NCOPC	1.92E-09	2.21E-09	1.53E-09	1.51E-09	1.63E-10
Chlorobenzene	NCOPC	NC	NC	NCOPC	NC	NC
Chloroform	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	7.83E-10
Chloromethane	NCOPC	NCOPC	NCOPC	NCOPC	1.07E-08	NCOPC
Dichloromethane	NCOPC	NCOPC	2.26E-10	NCOPC	NCOPC	1.49E-11
Tetrachloroethene	NCOPC	NCOPC	1.53E-08	NCOPC	NCOPC	1.31E-09
Toluene	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Trichloroethylene	NCOPC	NCOPC	1.89E-07	NCOPC	NCOPC	1.51E-08
<b>Total Risk</b>	<b>NCOPC</b>	<b>1.92E-09</b>	<b>2.12E-07</b>	<b>1.53E-09</b>	<b>1.22E-08</b>	<b>1.77E-08</b>
<b>Notes</b> MLE - Most Likely Exposure NC - No dose-response value NCOPC - Not a constituent of potential concern in this area/medium VOCs - Volatile Organic Compounds (a) Shallow groundwater (b) Mid groundwater						

TABLE 6-12  
TOTAL POTENTIAL HAZARD INDEX  
INDOOR INDUSTRIAL WORKER - MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS

Constituent	O	O North	Q North	Q South	R	
	AA-O-1-16 (a)	Leachate L-O-1	Leachate L-Q-1	AA-Q-6-24 (b)	AA-R-1-28 (b)	Leachate L-R-1
	Inhalation HQ	Inhalation HQ	Inhalation HQ	Inhalation HQ	Inhalation HQ	Inhalation HQ
<b>VOCs</b>						
1,2-Dichloroethane	NCOPC	NCOPC	4.12E-04	NCOPC	NCOPC	2.64E-05
1,2-Dichloroethene (total)	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	7.40E-09
4-Methyl-2-pentanone (MIBK)	NCOPC	6.40E-08	7.56E-08	NCOPC	NCOPC	NCOPC
Acetone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Benzene	NCOPC	2.90E-04	3.35E-04	2.31E-04	2.29E-04	2.47E-05
Chlorobenzene	NCOPC	7.46E-05	8.63E-05	NCOPC	5.85E-05	7.28E-06
Chloroform	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.03E-05
Chloromethane	NCOPC	NCOPC	NCOPC	NCOPC	6.60E-04	NCOPC
Dichloromethane	NCOPC	NCOPC	1.59E-06	NCOPC	NCOPC	1.06E-07
Tetrachloroethene	NCOPC	NCOPC	4.28E-05	NCOPC	NCOPC	3.67E-06
Toluene	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	2.07E-06
Trichloroethylene	NCOPC	NCOPC	4.71E-04	NCOPC	NCOPC	3.77E-05
<b>Total HI</b>	<b>NCOPC</b>	<b>3.65E-04</b>	<b>1.35E-03</b>	<b>2.31E-04</b>	<b>9.48E-04</b>	<b>1.12E-04</b>
Notes HI - Hazard Index HQ - Hazard Quotient NCOPC - Not a constituent of potential concern in this area/medium MLE - Most Likely Exposure NC - No dose-response value VOCs - Volatile Organic Compounds (a) Shallow groundwater (b) Mid groundwater						

TABLE 6-13  
TOTAL POTENTIAL CARCINOGENIC RISK  
OUTDOOR INDUSTRIAL WORKER - MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS

Constituent	O				O North				P			Q North			
	Soil (s)		AA-O-1-16	Total Risk	Soil (s)		Leachate	Total Risk	Soil (s)		Total Risk	Soil (s)		Leachate	Total Risk
	Ing/Derm.	Inhalation			Ing/Derm.	Inhalation			Ing/Derm.	Inhalation		Ing/Derm.	Inhalation		
VOCs															
1,1,2-Trichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,2-Dichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	2.00E-08	5.41E-08	7.42E-08
1,2-Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Acetone	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Benzene	NCOPC	3.07E-07	NCOPC	3.07E-07	NCOPC	1.88E-07	4.12E-09	1.92E-07	NCOPC	5.96E-09	5.96E-09	NCOPC	3.57E-09	1.79E-09	5.36E-09
Chlorobenzene	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Chloroform	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	3.43E-08	NCOPC	3.43E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC	3.13E-11	3.13E-11
Ethylbenzene	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NCOPC	NC
Tetrachloroethene	NCOPC	NCOPC	NCOPC	NC	NCOPC	4.25E-08	NCOPC	4.25E-08	NCOPC	3.12E-07	3.12E-07	NCOPC	2.75E-08	1.87E-09	2.94E-08
Toluene	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Trichloroethylene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	9.28E-08	9.28E-08	NCOPC	2.86E-08	2.07E-08	4.93E-08
Xylenes Total	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NCOPC	NC
SVOCs															
2,4,6-Trichlorophenol	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2-Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4-Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(a)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(a)pyrene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	1.84E-08	7.58E-12	1.84E-08	6.77E-08	3.12E-11	NCOPC	6.77E-08
Benzo(b)fluoranthene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1.18E-08	5.34E-12	NCOPC	1.18E-08
Pesticides															
4,4'-DDT	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
beta-BHC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dieldrin	3.32E-08	1.19E-11	NCOPC	3.32E-08	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Heptachlor	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Herbicides															
Pentachlorophenol	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
PCBs															
Total PCBs	2.21E-07	8.75E-11	NCOPC	2.21E-07	2.91E-05	7.65E-09	NCOPC	2.91E-05	7.32E-08	2.89E-11	7.32E-08	2.35E-08	9.29E-12	NCOPC	2.35E-08
Dioxin															
2,3,7,8-TCDD-TEQ	4.89E-06	2.00E-09	NCOPC	4.89E-06	8.31E-05	2.28E-08	NCOPC	8.32E-05	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Metals															
Antimony	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Arsenic	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	1.43E-07	1.73E-09	1.44E-07	NCOPC	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	1.03E-09	NCOPC	1.03E-09
Chromium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Manganese	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Mercury	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Total	5.14E-06	3.09E-07	NC	5.45E-06	1.12E-04	2.95E-07	4.12E-09	1.13E-04	2.32E-07	4.13E-07	6.48E-07	1.03E-07	8.07E-08	7.85E-08	2.62E-07
Notes															
(s) - Surface soil for ing/derm and inhalation of nonvolatile constituents, combined soil for inhalation of volatiles															
Ing/Derm - Ingestion/Dermal Contact															
MLE - Most Likely Exposure															
NC - Not Calculated or no dose-response value															
NCOPC - Not a constituent of potential concern in this area/medium															
PCBs - Polychlorinated Biphenyls															
SVOCs - Semivolatile Organic Compounds															
TCDD - TEQ - Tetrachlorodibenzo-p-dioxin															
Toxic Equivalents Concentration															
VOCs - Volatile Organic Compounds															

TABLE 8-13  
TOTAL POTENTIAL CARCINOGENIC RISK  
OUTDOOR INDUSTRIAL WORKER - MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS

Constituent	Q Central			Q South				R						S		
	Soil (a)		Total Risk	Soil (a)		AA-Q-4-24 Inhalation	Total	Soil (a)		AA-R-1-28 Inhalation	Leechate Inhalation	Max Value Inhalation	Total Risk	Soil (a)		Total Risk
	Ing/Derm.	Inhalation		Ing/Derm.	Inhalation			Ing/Derm.	Inhalation					Ing/Derm.	Inhalation	
VOCs																
1,1,2-Trichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	9.00E-09	NCOPC	NCOPC	NC	9.00E-09	NCOPC	NCOPC	NC
1,2-Dichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	8.12E-08	NCOPC	1.08E-08	1.08E-08	1.16E-08	NCOPC	NCOPC	NC
1,2-Dichloroethane (total)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC
Acetone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
Benzene	NCOPC	NCOPC	NC	NCOPC	6.87E-10	1.83E-09	2.52E-09	NCOPC	1.10E-08	8.25E-12	2.61E-08	2.61E-08	3.71E-08	NCOPC	5.04E-09	5.04E-09
Chlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NC	NC
Chloroform	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	6.95E-09	NCOPC	4.43E-08	4.43E-08	5.12E-08	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	8.37E-13	NCOPC	8.37E-13	6.37E-13	NCOPC	NCOPC	NC	NC
Dichloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.08E-09	1.08E-09	1.08E-09	NCOPC	2.45E-09	2.45E-09	NC
Ethylbenzene	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC
Tetrachloroethene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	1.75E-07	NCOPC	7.00E-07	7.00E-07	8.75E-07	NCOPC	1.05E-08	1.05E-08
Toluene	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NC	NC
Trichloroethylene	NCOPC	NCOPC	NC	NCOPC	5.95E-09	NCOPC	5.95E-09	NCOPC	1.24E-05	NCOPC	1.21E-04	1.21E-04	1.34E-04	NCOPC	2.62E-08	2.62E-08
Xylenes - Total	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC
SVOCs																
2,4,6-Trichlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.05E-09	3.69E-13	1.05E-09
2-Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC
4-Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC
Benzo(a)anthracene	NCOPC	NCOPC	NC	3.04E-09	1.40E-12	NCOPC	3.04E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.21E-08	1.02E-11	2.21E-08
Benzo(a)pyrene	NCOPC	NCOPC	NC	3.26E-08	1.50E-11	NCOPC	3.26E-08	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.51E-07	6.95E-11	1.51E-07
Benzo(b)fluoranthene	NCOPC	NCOPC	NC	3.95E-09	1.82E-12	NCOPC	3.95E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.86E-08	8.60E-12	1.86E-08
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	5.41E-08	2.50E-11	5.41E-08
Pesticides																
4,4'-DDT	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	6.21E-08	2.20E-11	6.21E-08
beta-BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	5.34E-07	1.98E-10	5.34E-07
Dieldrin	NCOPC	NCOPC	NC	2.91E-08	1.04E-11	NCOPC	2.91E-08	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.11E-07	NC	1.11E-07
Heptachlor	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	7.70E-08	2.77E-11	7.70E-08
Herbicides																
Pentachlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	6.02E-07	NC	6.02E-07
PCBs																
Total PCBs	4.42E-08	1.75E-11	4.42E-08	1.13E-07	4.46E-11	NCOPC	1.13E-07	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.07E-05	8.16E-09	2.07E-05
Dioxin																
2,3,7,8-TCDD-TEQ	1.86E-06	7.60E-10	1.86E-06	1.13E-06	4.61E-10	NCOPC	1.13E-06	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Metals																
Antimony	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Arsenic	7.38E-08	8.94E-10	7.47E-08	9.77E-08	1.18E-09	NCOPC	9.69E-08	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Chromium	NCOPC	NCOPC	NC	NC	2.86E-08	NCOPC	2.86E-08	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Manganese	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Mercury	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Total	1.98E-06	1.67E-09	1.98E-06	1.41E-06	3.70E-06	1.83E-09	1.48E-06	NC	1.27E-05	8.88E-12	1.23E-04	1.23E-04	1.34E-04	2.23E-05	2.64E-06	2.50E-05
Notes																
(a) - Surface soil for ing/derm and inhalation of nonvolatile constituents combined soil for inhalation of volatiles																
Ing/Derm - Ingestion/Dermal Contact																
MLE - Most Likely Exposure																
NC - Not Calculated or no dose-response value																
NCOPC - Not a constituent of potential concern in this area/medium																
PCBs - Polychlorinated Biphenyls																
SVOCs - Semivolatile Organic Compounds																
TCDD - TEQ - Tetrachlorodibenzo-p-dioxin																
Toxic Equivalents Concentration																
VOCs - Volatile Organic Compounds																

TABLE 6-14  
TOTAL POTENTIAL HAZARD INDEX  
OUTDOOR INDUSTRIAL WORKER - MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/FS

Constituent	O				O North				P			Q North			
	Soil (s)		AA-O-1-18	Total	Soil (s)		Leachate	Total	Soil (s)		Total	Soil (s)		Leachate	Total
	Ing/Derm	Inhalation	Inhalation	HQ	Ing/Derm	Inhalation	Inhalation	HQ	Ing/Derm	Inhalation	HQ	Ing/Derm	Inhalation	Inhalation	HQ
VOCs															
1 1 2-Trichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1 2-Dichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	1 57E-03	4 25E-03	5 82E-03
1 2-Dichloroethene (total)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	2 57E-06	2 57E-06	NCOPC	NCOPC	NC	NCOPC	NCOPC	3 40E-06	3 40E-06
Acetone	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Benzene	NCOPC	4 65E-02	NCOPC	4 65E-02	NCOPC	2 85E-02	6 25E-04	2 91E-02	NCOPC	9 02E-04	9 02E-04	NCOPC	5 41E-04	2 71E-04	8 12E-04
Chlorobenzene	NCOPC	5 25E-02	NCOPC	5 25E-02	NCOPC	1 08E-01	4 20E-04	1 09E-01	NCOPC	NCOPC	NC	NCOPC	NCOPC	2 52E-04	2 52E-04
Chloroform	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	2 42E-04	NCOPC	2 42E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	2 21E-07	2 21E-07
Ethylbenzene	NCOPC	6 86E-03	NCOPC	6 86E-03	NCOPC	9 98E-03	NCOPC	9 98E-03	NCOPC	2 91E-04	2 91E-04	NCOPC	8 32E-05	NCOPC	8 32E-05
Tetrachloroethene	NCOPC	NCOPC	NCOPC	NC	NCOPC	1 19E-04	NCOPC	1 19E-04	NCOPC	6 75E-04	6 75E-04	NCOPC	7 70E-05	5 25E-06	8 22E-05
Toluene	NCOPC	2 50E-03	NCOPC	2 50E-03	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Trichloroethylene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	2 32E-04	2 32E-04	NCOPC	7 14E-05	5 18E-05	1 23E-04
Xylenes Total	NCOPC	3 54E-01	NCOPC	3 54E-01	NCOPC	5 21E-01	NCOPC	5 21E-01	NCOPC	1 54E-02	1 54E-02	NCOPC	6 04E-03	NCOPC	6 04E-03
SVOCs															
2 4 6-Trichlorophenol	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2 Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4-Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(a)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(a)pyrene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NCOPC	NC
Benzo(b)fluoranthene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC
Pesticides															
4 4-DDT	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
beta-BHC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dieldrin	4 15E-04	NC	NCOPC	4 15E-04	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Heptachlor	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Herbicides															
Pentachlorophenol	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
PCBs															
Total PCBs	5 53E-02	NC	NCOPC	5 53E-02	7 27E+00	NC	NCOPC	7 27E+00	1 83E-02	NC	1 83E-02	5 87E-03	NC	NCOPC	5 87E-03
Dioxin															
2 3 7 8-TCDD-TEQ	NC	NC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Metals															
Antimony	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Arsenic	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	3 17E-03	NC	3 17E-03	NCOPC	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4 89E-03	NC	NCOPC	4 89E-03
Chromium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Manganese	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Mercury	NCOPC	NCOPC	NCOPC	NC	6 45E-02	2 71E-05	NCOPC	6 45E-02	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Total HI	5 57E-02	4 82E-01	NCOPC	5 18E-01	7 33E+00	6 68E-01	1 08E-03	8 00E+00	2 15E-02	1 77E-02	3 82E-02	1 08E-02	6 38E-03	4 83E-03	2 48E-02
Notes															
(a) - Surface soil for ing/derm and inhalation of nonvolatile constituents combined soil for inhalation of volatiles															
Ing/Derm - Ingestion/Dermal Contact															
HI - Hazard Index															
HQ - Hazard Quotient															
MLE - Most Likely Exposure															
NC - Not Calculated or no dose-response value															
NCOPC - Not a constituent of potential concern in this area/medium															
PCBs - Polychlorinated Biphenyls															
SVOCs - Semivolatile Organic Compounds															
TCDD - TEQ - Tetrachlorodibenzo-p-dioxin															
Toxic Equivalents Concentration															
VOCs - Volatile Organic Compounds															

TABLE 6-14  
TOTAL POTENTIAL HAZARD INDEX  
OUTDOOR INDUSTRIAL WORKER - MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/FS

Constituent	Q Central			Q South				R						S		
	Soil (a)		Total HQ	Soil (a)		AA-Q-4-24 Inhalation	Total HQ	Soil (a)		AA-R-1-28 Inhalation	Leachate Inhalation	Max Value Inhalation	Total HQ	Soil (a)		Total HQ
	Ing/Derm	Inhalation		Ing/Derm	Inhalation			Ing/Derm	Inhalation					Ing/Derm	Inhalation	
VOCs																
1,1,2-Trichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
1,2-Dichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	6.37E-03	NCOPC	8.50E-02	8.50E-02	9.14E-02	NCOPC	NCOPC	NC
1,2-Dichloroethane (total)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	1.52E-05	1.52E-05	1.52E-05	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	3.54E-04	3.54E-04
Acetone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
Benzene	NCOPC	NCOPC	NC	NCOPC	1.04E-04	2.78E-04	3.82E-04	NCOPC	1.67E-03	1.25E-08	3.98E-03	3.98E-03	5.62E-03	NCOPC	7.83E-04	7.83E-04
Chlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	3.85E-03	2.03E-08	2.55E-04	2.55E-04	4.10E-03	NCOPC	4.55E-03	4.55E-03
Chloroform	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	9.15E-05	NCOPC	5.82E-04	5.82E-04	6.74E-04	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	3.93E-08	NCOPC	3.93E-08	NC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	7.61E-06	7.61E-06	7.61E-06	NCOPC	1.73E-05	1.73E-05
Ethylbenzene	NCOPC	NCOPC	NC	NCOPC	3.33E-04	NCOPC	3.33E-04	NCOPC	7.28E-06	NCOPC	NCOPC	NC	7.28E-06	NCOPC	2.50E-04	2.50E-04
Tetrachloroethene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	4.90E-04	NCOPC	1.96E-03	1.96E-03	2.45E-03	NCOPC	2.94E-05	2.94E-05
Toluene	NCOPC	NCOPC	NC	NCOPC	3.91E-03	NCOPC	3.91E-03	NCOPC	6.28E-04	NCOPC	9.92E-04	9.92E-04	1.62E-03	NCOPC	4.54E-03	4.54E-03
Trichloroethylene	NCOPC	NCOPC	NC	NCOPC	1.49E-05	NCOPC	1.49E-05	NCOPC	3.09E-02	NCOPC	3.03E-01	3.03E-01	3.34E-01	NCOPC	6.54E-03	6.54E-03
Xylenes Total	NCOPC	NCOPC	NC	NCOPC	2.29E-02	NCOPC	2.29E-02	NCOPC	4.58E-04	NCOPC	NCOPC	NC	4.58E-04	NCOPC	1.75E-02	1.75E-02
SVOCs																
2,4,6-Trichlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	9.56E-03	NC	9.56E-03
2-Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	3.94E-08	3.94E-08
4-Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.20E-03	2.06E-06	2.20E-03
Benzo(a)anthracene	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC
Benzo(a)pyrene	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC
Benzo(b)fluoranthene	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC
Pesticides																
4,4'-DDT	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	3.65E-03	NC	3.65E-03
beta-BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	9.88E-03	NC	9.88E-03
Dieldrin	NCOPC	NCOPC	NC	3.63E-04	NC	NCOPC	3.63E-04	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.85E-03	NC	2.85E-03
Heptachlor	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	3.42E-04	NC	3.42E-04
Herbicides																
Pentachlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.67E-03	NC	1.67E-03
PCBs																
Total PCBs	1.11E-02	NC	1.11E-02	2.82E-02	NC	NCOPC	2.82E-02	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	5.17E+00	NC	5.17E+00
Dioxin																
2,3,7,8-TCDD-TEQ	NC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Metals																
Antimony	NCOPC	NCOPC	NC	3.94E-03	NC	NCOPC	3.94E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Arsenic	1.64E-03	NC	1.64E-03	2.17E-03	NC	NCOPC	2.17E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Chromium	NCOPC	NCOPC	NC	1.88E-03	2.38E-04	NCOPC	2.11E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Manganese	NCOPC	NCOPC	NC	5.73E-03	3.43E-03	NCOPC	9.16E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Mercury	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC
Total HI	1.27E-02	NC	1.27E-02	4.23E-02	3.09E-02	2.78E-04	7.38E-02	NCOPC	4.48E-02	3.32E-08	3.98E-01	3.98E-01	4.41E-01	5.20E+00	3.45E-02	5.23E+00
Notes (a) - Surface soil for Ing/Derm and inhalation of nonvolatile constituents combined soil for inhalation of volatiles Ing/Derm - Ingestion/Dermal Contact HI - Hazard Index HQ - Hazard Quotient MLE - Most Likely Exposure NC - Not Calculated or no dose-response value NCOPC - Not a constituent of potential concern in this area/medium PCBs - Polychlorinated Biphenyls SVOCs - Semivolatile Organic Compounds TCDD - TEQ - Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration VOCs - Volatile Organic Compounds																

TABLE 6.15  
TOTAL POTENTIAL CARCINOGENIC RISK  
CONSTRUCTION/UTILITY WORKER - MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RVFS

Constituent	O					O North					P					Q North				
	Combined Soil		AA-O-1-18		Total Risk	Combined Soil		Leachate		Total Risk	Combined Soil		Total Risk	Combined Soil		Total Risk	Combined Soil		Total Risk	Total Risk
	Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation		
VOCs																				
1,1,2 Trichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,2 Dichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,2 Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2 Butanone (MEK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4-Methyl 2-pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Acetone	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC
Benzene	1.24E-09	1.78E-07	NCOPC	NCOPC	1.77E-07	5.60E-10	7.85E-08	5.96E-09	2.57E-08	1.11E-07	8.51E-12	1.14E-09	1.15E-09	8.71E-12	1.24E-09	2.75E-09	1.19E-08	1.19E-08	1.59E-08	
Chlorobenzene	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC
Chloroform	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	2.28E-10	1.83E-08	NCOPC	NCOPC	1.86E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Ethylbenzene	NC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC
Tetrachloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.51E-09	1.78E-08	NCOPC	NCOPC	1.93E-08	5.66E-09	6.48E-08	7.04E-08	8.30E-10	9.86E-09	2.06E-08	5.60E-09	5.60E-09	3.69E-08	
Toluene	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Trichloroethylene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	6.31E-11	1.72E-08	1.72E-08	3.38E-11	9.12E-09	1.31E-09	2.77E-08	2.77E-08	3.82E-08	
Xylenes, Total	NC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
SVOCs																				
1,2-Dichlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,3-Dichlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
1,4-Dichlorobenzene	3.83E-10	3.32E-12	NCOPC	NCOPC	3.57E-10	1.20E-09	1.13E-11	NCOPC	NCOPC	1.21E-09	4.81E-10	4.33E-12	4.68E-10	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2,4,6-Trichlorophenol	2.23E-11	2.28E-13	NCOPC	NCOPC	2.25E-11	2.08E-10	2.10E-12	2.01E-09	NCOPC	2.22E-09	NCOPC	NCOPC	NC	3.37E-11	3.40E-13	8.81E-08	NCOPC	NCOPC	NCOPC	6.61E-08
2,4-Dichlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC
2,4-Dimethylphenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2-Chlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2-Methylnaphthalene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2-Nitroaniline	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC
3-Methylphenol/4 Methylphenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4-Chloroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4-Nitroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(a)anthracene	1.18E-09	1.15E-11	NCOPC	NCOPC	1.19E-09	3.81E-09	3.83E-11	NCOPC	NCOPC	3.95E-09	NCOPC	NCOPC	NC	3.15E-10	3.08E-12	NCOPC	NCOPC	NCOPC	NCOPC	3.18E-10
Benzo(a)pyrene	7.35E-09	7.20E-11	1.31E-07	NCOPC	1.38E-07	1.88E-08	1.63E-10	NCOPC	NCOPC	1.88E-08	6.71E-10	8.86E-12	8.77E-10	3.38E-09	3.29E-11	NCOPC	NCOPC	NCOPC	NCOPC	3.39E-09
Benzo(b)fluoranthene	8.09E-10	7.92E-12	9.01E-09	NCOPC	9.82E-09	1.56E-09	1.53E-11	NCOPC	NCOPC	1.58E-09	NCOPC	NCOPC	NC	3.00E-10	2.94E-12	NCOPC	NCOPC	NCOPC	NCOPC	3.03E-10
Benzo(g,h,i)perylene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(k)fluoranthene	NCOPC	NCOPC	9.82E-10	NCOPC	9.82E-10	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
bis(2-Chloroethyl)phthalate	NCOPC	NCOPC	NCOPC	NCOPC	NC	9.88E-10	1.08E-11	NCOPC	NCOPC	9.98E-10	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
bis(2-Ethylhexyl)phthalate	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dibenz(a,h)anthracene	2.17E-09	2.13E-11	4.97E-07	NCOPC	4.99E-07	5.42E-09	5.30E-11	NCOPC	NCOPC	5.47E-09	NCOPC	NCOPC	NC	5.39E-10	5.27E-12	NCOPC	NCOPC	NCOPC	NCOPC	5.44E-10
Hexachlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	2.73E-09	2.52E-11	NCOPC	NCOPC	2.75E-09	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Indeno(1,2,3-cd)pyrene	NCOPC	NCOPC	3.89E-08	NCOPC	3.89E-08	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Naphthalene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Nitrobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Pesticides																				
4,4'-DDE	NCOPC	NCOPC	NCOPC	NCOPC	NC	4.56E-09	NC	NCOPC	NCOPC	4.56E-09	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
4,4'-DDT	NCOPC	NCOPC	NCOPC	NCOPC	NC	5.47E-09	5.59E-11	NCOPC	NCOPC	5.52E-09	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Aldrin	1.95E-09	2.01E-11	NCOPC	NCOPC	1.97E-09	2.84E-08	3.04E-10	NCOPC	NCOPC	2.97E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
alpha-BHC	NCOPC	NCOPC	NCOPC	NCOPC	NC	2.97E-09	3.04E-11	NCOPC	NCOPC	3.00E-09	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
beta-BHC	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.03E-08	1.08E-10	7.36E-10	NCOPC	1.11E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	3.97E-09
delta-BHC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Dieldrin	1.59E-08	1.84E-10	NCOPC	NCOPC	1.61E-08	2.45E-07	2.62E-09	NCOPC	NCOPC	2.48E-07	1.58E-08	1.83E-11	1.60E-09	4.38E-09	4.48E-11	NCOPC	NCOPC	NCOPC	NCOPC	4.39E-09
Endrin Ketone	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	5.18E-10	NC	NCOPC	NCOPC	5.18E-10	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Heptachlor	2.78E-09	2.88E-11	NCOPC	NCOPC	2.81E-09	1.20E-08	1.25E-10	NCOPC	NCOPC	1.22E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Heptachlor epoxide	1.05E-09	1.07E-11	NCOPC	NCOPC	1.06E-09	8.96E-09	9.18E-11	NCOPC	NCOPC	9.04E-09	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Herbicides																				
2,4,5-T	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
2,4-D	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
MCPA	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
MCPP	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC
Pentachlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	5.69E-07	NCOPC	5.69E-07	NCOPC	NCOPC	NC	5.17E-09	NC	3.38E-08	NCOPC	NCOPC	NCOPC	3.38E-08

TABLE 6-15  
TOTAL POTENTIAL CARCINOGENIC RISK  
CONSTRUCTION/UTILITY WORKER - MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RVFS

Constituent	O					O North					P			Q North				
	Combined Soil		AA-O-1-16		Total Risk	Combined Soil		Leachate		Total Risk	Combined Soil		Total Risk	Combined Soil		Leachate		Total Risk
	Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation	Ing/Derm	Inhalation	
PCBs																		
Total PCBs	1.22E-07	1.12E-09	NCOPC	NCOPC	1.24E-07	3.13E-06	2.87E-08	8.02E-07	NCOPC	3.96E-06	7.80E-09	7.15E-11	7.87E-09	5.14E-08	4.72E-10	1.52E-08	NCOPC	6.71E-08
Dioxin																		
2,3,7,8-TCDD-TEQ	5.48E-07	4.26E-09	NCOPC	NCOPC	5.52E-07	2.78E-05	2.18E-07	2.43E-06	NCOPC	3.04E-05	2.42E-08	1.88E-10	2.44E-08	4.48E-07	3.48E-09	NCOPC	NCOPC	4.52E-07
Metals																		
Antimony	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC
Arsenic	NCOPC	NCOPC	1.62E-09	NCOPC	1.62E-09	6.65E-09	2.43E-09	NCOPC	NCOPC	9.09E-09	4.29E-09	1.57E-09	5.65E-09	3.92E-09	1.43E-09	NCOPC	NCOPC	5.35E-09
Barium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
Beryllium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.00E-09	NCOPC	NCOPC	2.00E-09	NC	5.41E-10	5.41E-10	NC	6.22E-10	NCOPC	NCOPC	6.22E-10
Chromium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Cobalt	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Copper	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Lead	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
Manganese	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC
Mercury	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Nickel	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC
<b>Total</b>	<b>7.08E-07</b>	<b>1.81E-07</b>	<b>6.79E-07</b>	<b>NCOPC</b>	<b>1.67E-06</b>	<b>3.13E-05</b>	<b>3.67E-07</b>	<b>3.81E-06</b>	<b>2.57E-06</b>	<b>3.88E-05</b>	<b>4.47E-08</b>	<b>6.55E-08</b>	<b>1.30E-07</b>	<b>6.19E-07</b>	<b>2.99E-08</b>	<b>3.48E-06</b>	<b>7.52E-07</b>	<b>4.78E-06</b>
Notes Ing/Derm - Ingestion/Dermal Contact MLE - Most Likely Exposure NC - Not Calculated or no dose-response value NCOPC - Not a constituent of potential concern in this area/medium PCBs - Polychlorinated Biphenyls SVOCs - Semivolatile Organic Compounds TCDD - TEQ - Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration VOCs - Volatile Organic Compounds																		

TABLE 6.15  
TOTAL POTENTIAL CARCINOGENIC RISK  
CONSTRUCTION/UTILITY WORKER: MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/VFS

Constituent	Q Central			Q South			R			S				
	Combined Soil		Total Risk	Combined Soil		Total Risk	Combined Soil		Leachate		Total Risk	Combined Soil		Total Risk
	Ing/Derm.	Inhalation		Ing/Derm.	Inhalation		Ing/Derm.	Inhalation	Ing/Derm.	Inhalation				
VOCs														
1 2-Trichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	7.57E-11	9.77E-10	NCOPC	NCOPC	1.05E-09	NCOPC	NCOPC	NC
1 2-Dichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1.20E-09	9.04E-09	2.89E-07	1.64E-05	1.67E-05	NCOPC	NCOPC	NC
1 2-Dichloroethane (total)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
4-Methyl 2-pentanone (MIBK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
Acetone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC
Benzene	NCOPC	NCOPC	NC	1.72E-12	2.38E-10	2.39E-10	3.37E-10	1.24E-09	4.40E-08	1.90E-07	2.36E-07	1.51E-10	5.58E-10	7.09E-10
Chlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Chloroform	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	7.84E-10	NC	3.91E-07	3.92E-07	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.18E-09	1.27E-08	1.39E-08	1.02E-10	2.65E-10	3.87E-10
Ethylbenzene	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC
Tetrachloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	9.54E-08	2.03E-08	8.23E-06	2.24E-06	1.06E-05	5.51E-09	1.18E-09	6.69E-09
Toluene	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
Trichloroethylene	NCOPC	NCOPC	NC	6.87E-12	1.82E-09	1.83E-09	7.98E-08	1.40E-08	9.80E-06	2.08E-04	2.19E-04	1.70E-08	3.01E-07	3.18E-07
Xylenes Total	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC
SVOCs														
1 2-Dichlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
1 3-Dichlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
1 4-Dichlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4.75E-11	4.48E-13	NCOPC	NCOPC	4.79E-11	7.38E-10	6.91E-12	7.43E-10
2 4 6-Trichlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	6.38E-10	6.42E-12	NCOPC	NCOPC	6.42E-10	2.63E-11	2.65E-13	2.65E-11
2 4-Dichlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2 4-Dimethylphenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2-Chlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC
2-Methylnaphthalene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2-Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC
3-Methylphenol/4-Methylphenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
4-Chloroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
4-Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NC	NC	NC
Benzo(a)anthracene	1.55E-10	1.52E-12	1.56E-10	1.51E-10	1.48E-12	1.53E-10	NCOPC	NCOPC	NCOPC	NCOPC	NC	7.55E-10	7.39E-12	7.63E-10
Benzo(a)pyrene	1.84E-09	1.80E-11	1.85E-09	1.74E-09	1.70E-11	1.78E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	5.92E-09	5.79E-11	5.98E-09
Benzo(b)fluoranthene	2.00E-10	1.95E-12	2.02E-10	1.81E-10	1.77E-12	1.83E-10	NCOPC	NCOPC	NCOPC	NCOPC	NC	6.75E-10	6.61E-12	6.82E-10
Benzo(g,h,i)perylene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Benzo(k)fluoranthene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
bis(2-Chloroethyl)ether	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
bis(2-Ethylhexyl)phthalate	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	5.23E-10	NC	5.23E-10
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	2.53E-09	2.48E-11	2.59E-09
Hexachlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Indeno(1,2,3-cd)pyrene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Naphthalene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC
Nitrobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Pesticides														
4,4'-DDE	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4,4'-DDT	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.88E-07	NCOPC	2.88E-07	7.73E-12	7.64E-10	
Aldrin	2.53E-10	2.51E-12	2.56E-10	5.24E-10	5.41E-12	5.30E-10	NCOPC	NCOPC	NCOPC	NCOPC	NC	8.06E-10	8.35E-12	8.17E-10
alpha-BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
beta-BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4.94E-10	5.21E-12	5.88E-08	NCOPC	5.93E-08	8.20E-09	6.64E-11	6.26E-09
delta-BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Dieldrin	6.82E-10	9.09E-12	6.91E-10	1.67E-09	1.72E-11	1.69E-09	4.29E-09	4.42E-11	4.97E-07	NCOPC	5.01E-07	1.43E-09	1.47E-11	1.44E-09
Endrin Ketone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	5.27E-09	NCOPC	5.27E-09	1.30E-09	NC	1.30E-09
Heptachlor	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	6.59E-10	6.82E-12	1.10E-07	NCOPC	1.11E-07	9.65E-10	9.98E-12	9.75E-10
Heptachlor epoxide	NCOPC	NCOPC	NC	2.89E-10	2.78E-12	2.72E-10	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Herbicides														
2 4 5-T	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2 4-D	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
MCFA	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
MCPP	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Pentachlorophenol	1.54E-10	NC	1.54E-10	3.37E-09	NC	3.37E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.08E-08	NC	1.08E-08

TABLE 6.15  
TOTAL POTENTIAL CARCINOGENIC RISK  
CONSTRUCTION/UTILITY WORKER MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/VF5

Constituent	Q Central			Q South			R					S		
	Combined Soil		Total Risk	Combined Soil		Total Risk	Combined Soil		Leachate		Total Risk	Combined Soil		Total Risk
	Ing/Derm.	Inhalation		Ing/Derm.	Inhalation		Ing/Derm.	Inhalation	Ing/Derm.	Inhalation		Ing/Derm.	Inhalation	
PCBs											NC			
Total PCBs	4.21E-09	3.86E-11	4.25E-09	9.93E-09	9.11E-11	1.00E-08	7.23E-08	6.63E-10	5.82E-05	NCOPC	5.82E-05	3.09E-07	2.83E-09	3.11E-07
Dioxin											NC			
2,3,7,8-TCDD-TEQ	2.07E-07	1.61E-09	2.09E-07	1.64E-07	1.43E-09	1.65E-07	1.12E-07	6.73E-10	1.11E-05	NCOPC	1.12E-05	3.99E-07	3.10E-09	4.03E-07
Metals											NC			
Antimony	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Arsenic	4.90E-09	1.79E-09	6.69E-09	4.37E-09	1.60E-09	5.96E-09	2.04E-09	7.44E-10	NCOPC	NCOPC	2.78E-09	NCOPC	NCOPC	NC
Barium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Beryllium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Cadmium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Chromium	NCOPC	NCOPC	NC	NC	2.98E-08	2.98E-08	NCOPC	NCOPC	NC	NCOPC	NC	NC	6.08E-08	6.06E-08
Cobalt	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Copper	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Lead	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
Manganese	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Mercury	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Nickel	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC
Total	2.20E-07	3.47E-09	2.23E-07	2.08E-07	3.51E-08	2.41E-07	3.70E-07	1.43E-08	8.88E-05	2.27E-04	3.17E-04	7.84E-07	3.69E-07	1.13E-06
Notes Ing/Derm. - Ingestion/Dermal Contact MLE - Most Likely Exposure NC - Not Calculated or no dose-response value NCOPC - Not a constituent of potential concern in this area/medium PCBs - Polychlorinated Biphenyls SVOCs - Semivolatile Organic Compounds TCDD - TEQ - Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration VOCs - Volatile Organic Compounds														

TABLE 6.16  
TOTAL POTENTIAL HAZARD INDEX  
CONSTRUCTION/UTILITY WORKER MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RVFS

Constituent	O					O North					P					Q North				
	Combined Soil		AA-Q-1-16		Total HQ	Combined Soil		Leachate		Total HQ	Combined Soil		Total HQ	Combined Soil		Total HQ	Combined Soil		Total HQ	Total HQ
	Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation	Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation		
VOCs																				
1,1,2-Trichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
1,2-Dichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	1.11E-01
1,2-Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	7.32E-06	1.41E-08	2.14E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.61E-05	5.04E-05
Acetone	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.89E-08	NC
Benzene	1.45E-03	1.86E-01	NCOPC	NCOPC	1.88E-01	6.53E-04	8.33E-02	6.95E-03	7.80E-03	9.87E-02	9.93E-06	1.21E-03	1.22E-03	1.02E-05	1.32E-03	3.21E-03	3.80E-03	8.14E-03	8.14E-03	8.14E-03
Chlorobenzene	8.06E-04	8.84E-02	NCOPC	NCOPC	8.90E-02	8.88E-04	1.27E-01	2.36E-03	6.65E-03	1.37E-01	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.80E-03	4.50E-03	6.09E-03	6.09E-03	6.09E-03
Chloroform	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	3.55E-06	9.07E-04	NCOPC	NCOPC	9.42E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	4.45E-06	4.45E-06	8.91E-06
Ethylbenzene	2.67E-04	1.28E-02	NCOPC	NCOPC	1.31E-02	2.78E-04	1.35E-02	NCOPC	NCOPC	1.37E-02	4.79E-06	2.33E-04	2.38E-04	1.91E-06	9.20E-05	NCOPC	NCOPC	NCOPC	NCOPC	9.39E-05
Tetrachloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.95E-05	3.48E-04	NCOPC	NCOPC	3.68E-04	7.21E-05	1.34E-03	1.08E-05	1.93E-04	3.11E-05	5.02E-04	NCOPC	NCOPC	NCOPC	NC
Toluene	1.91E-05	7.17E-03	NCOPC	NCOPC	7.19E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Trichloroethylene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	3.68E-05	3.01E-04	3.37E-04	1.98E-06	1.80E-04	1.21E-04	1.21E-04	1.06E-03	1.06E-03	1.06E-03
Xylenes, Total	6.64E-04	7.56E-01	NCOPC	NCOPC	7.57E-01	7.20E-04	7.69E-01	NCOPC	NCOPC	7.90E-01	1.12E-05	1.22E-02	1.22E-02	7.07E-06	7.56E-03	NCOPC	NCOPC	NCOPC	NCOPC	7.57E-03
SVOCs																				
1,2-Dichlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.51E-04	2.44E-06	NCOPC	NCOPC	1.53E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
1,3-Dichlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	3.63E-04	1.48E-08	NCOPC	NCOPC	3.63E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
1,4-Dichlorobenzene	3.44E-05	4.82E-08	NCOPC	NCOPC	3.44E-05	1.17E-04	1.57E-07	NCOPC	NCOPC	1.17E-04	4.48E-05	8.02E-08	4.48E-05	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
2,4,6-Trichlorophenol	1.42E-03	NC	NCOPC	NCOPC	1.42E-03	1.32E-02	NC	1.28E-01	NCOPC	1.41E-01	NCOPC	NCOPC	NC	2.15E-03	NC	4.21E+00	NCOPC	4.21E+00	NCOPC	4.21E+00
2,4-Dichlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	9.07E-01
2,4-Dimethylphenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.29E-04	NCOPC	1.29E-04	NCOPC	1.29E-04
2-Chlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	5.39E-04	NCOPC	5.39E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.29E-02	NCOPC	1.29E-02	NCOPC	1.29E-02
2-Methylnaphthalene	NCOPC	NCOPC	NCOPC	NCOPC	NC	2.68E-04	5.44E-05	NCOPC	NCOPC	3.20E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
2-Nitroaniline	NC	1.11E-05	NCOPC	NCOPC	1.11E-05	NC	2.27E-04	NC	NCOPC	2.27E-04	NCOPC	NCOPC	NC	NC	3.75E-06	NC	NCOPC	NCOPC	NCOPC	3.75E-05
3-Methylphenol/4-Methylphenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	9.82E-06	NCOPC	9.82E-06	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.40E-04	NCOPC	2.40E-04	NCOPC	2.40E-04
4-Chloroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	5.37E-03	NCOPC	5.37E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.19E-02	NCOPC	1.19E-02	NCOPC	1.19E-02
4-Nitroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	6.30E-03	1.70E-04	6.33E-04	NCOPC	7.10E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	9.68E-04	NCOPC	9.68E-04	NCOPC	9.68E-04
Benzo(a)anthracene	NC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(a)pyrene	NC	NC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(b)fluoranthene	NC	NC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC
Benzo(g,h,i)perylene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Benzo(k)fluoranthene	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
bis(2-Chloroethyl)ether	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
bis(2-Ethylhexyl)phthalate	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Dibenz(a,h)anthracene	NC	NC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC
Hexachlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.49E-04	NC	NCOPC	NCOPC	1.49E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Indeno(1,2,3-cd)pyrene	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Naphthalene	NCOPC	NCOPC	NCOPC	NCOPC	NC	5.90E-05	1.21E-05	1.31E-03	NCOPC	1.38E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	2.78E-03	NCOPC	2.78E-03	NCOPC	2.78E-03
Nitrobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	4.52E-04	4.08E-06	8.84E-04	NCOPC	1.34E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.44E-02	NCOPC	1.44E-02	NCOPC	1.44E-02
Phenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	5.79E-05	NCOPC	5.79E-05	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.23E-04	NCOPC	1.23E-04	NCOPC	1.23E-04
Pesticides																				
4,4-DDE	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.87E-03	NC	NCOPC	NCOPC	1.87E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
4,4-DDT	NCOPC	NCOPC	NCOPC	NCOPC	NC	2.25E-03	NC	NCOPC	NCOPC	2.25E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Aldrin	2.67E-04	NC	NCOPC	NCOPC	2.67E-04	4.04E-03	NC	NCOPC	NCOPC	4.04E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
alpha-BHC	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.10E-04	NC	NCOPC	NCOPC	1.10E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
beta-BHC	NCOPC	NCOPC	NCOPC	NCOPC	NC	1.33E-03	NC	9.53E-05	NCOPC	1.43E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	5.14E-04	NCOPC	5.14E-04	NCOPC	5.14E-04
delta-BHC	1.68E-04	NC	NCOPC	NCOPC	1.68E-04	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Dieldrin	1.39E-03	NC	NCOPC	NCOPC	1.39E-03	2.14E-02	NC	NCOPC	NCOPC	2.14E-02	1.38E-04	NC	1.38E-04	3.80E-04	NC	NCOPC	NCOPC	NCOPC	NCOPC	3.80E-04
Endrin Ketone	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.22E-04	NCOPC	1.22E-04	NCOPC	1.22E-04
gamma-BHC (Lindane)	9.29E-05	NC	NCOPC	NCOPC	9.29E-05	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Heptachlor	6.66E-05	NC	NCOPC	NCOPC	6.66E-05	3.74E-04	NC	NCOPC	NCOPC	3.74E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Heptachlor epoxide	6.19E-04	NC	NCOPC	NCOPC	6.19E-04	5.30E-03	NC	NCOPC	NCOPC	5.30E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Herbicides																				
2,4,5-T	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	5.14E-06	NCOPC	5.14E-06	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
2,4-D	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	6.04E-04	NCOPC	6.04E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	6.27E-02	NCOPC	6.27E-02	NCOPC	6.27E-02
MCPA	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	2.38E-03	NC	2.38E-03	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
MCPP	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC
Pentachlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.11E-02	NCOPC	1.11E-02	NCOPC	NCOPC	NC	1.20E-04	NC	6.53E-02	NCOPC	6.53E-02	NCOPC	6.53E-02

TABLE 6-16  
TOTAL POTENTIAL HAZARD INDEX  
CONSTRUCTION/UTILITY WORKER MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/VS

Constituent	O					O North					P					Q North				
	Combined Soil		AA-O-1-16		Total HQ	Combined Soil		Leachate		Total HQ	Combined Soil		Total HQ	Combined Soil		Total HQ	Combined Soil		Total HQ	Total HQ
	Ing/Derm.	Inhalation	Ing/Derm.	Inhalation		Ing/Derm.	Inhalation	Ing/Derm.	Inhalation		Ing/Derm.	Inhalation		Ing/Derm.	Inhalation		Ing/Derm.	Inhalation		
PCBs																				
Total PCBs	2.14E-01	NC	NCOPC	NCOPC	2.14E-01	5.48E+00	NC	1.40E+00	NCOPC	6.89E+00	1.36E-02	NC	1.36E-02	9.00E-02	NC	2.67E-02	NCOPC	NCOPC	1.17E-01	
Dioxin																				
2,3,7,8-TCDD TEQ	NC	NC	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NC	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	
Metals																				
Antimony	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1.04E-03	NC	6.72E-05	NCOPC	NCOPC	1.11E-03	
Arsenic	NCOPC	NCOPC	2.53E-04	NCOPC	2.53E-04	1.04E-03	NC	NCOPC	NCOPC	1.04E-03	6.68E-04	NC	6.68E-04	6.10E-04	NC	NCOPC	NCOPC	NCOPC	6.10E-04	
Barium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	9.95E-04	5.54E-03	NCOPC	NCOPC	NCOPC	5.54E-03	
Beryllium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC	
Cadmium	NCOPC	NCOPC	NCOPC	NCOPC	NC	2.78E-03	NC	NCOPC	NCOPC	2.78E-03	7.46E-04	NC	7.46E-04	6.58E-04	NC	NCOPC	NCOPC	NCOPC	6.58E-04	
Chromium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC	
Cobalt	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC	
Copper	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC	
Lead	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NC	
Manganese	NCOPC	NCOPC	3.46E-04	NCOPC	3.46E-04	NCOPC	NCOPC	1.52E-03	NCOPC	1.52E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.52E-04	NCOPC	NCOPC	1.52E-04	
Mercury	NCOPC	NCOPC	NCOPC	NCOPC	NC	5.70E-02	1.08E-03	NCOPC	NCOPC	5.81E-02	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC	
Nickel	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	5.77E-05	NCOPC	NCOPC	5.77E-05	
Thallium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	6.01E-06	NCOPC	6.01E-06	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC	
Vanadium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NCOPC	NC	
Zinc	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	6.84E-06	NCOPC	NCOPC	6.84E-06	
Total HQ	2.21E-01	1.05E+00	6.98E-04	NCOPC	1.27E+00	6.80E+00	1.02E+00	1.56E+00	1.45E-02	8.20E+00	1.76E-02	1.62E-02	3.29E-02	9.68E-02	1.66E-02	5.32E+00	1.17E-01	5.56E+00		
Notes: Ing/Derm - Ingestion/Dermal Contact HI - Hazard Index HQ - Hazard Quotient MLE - Most Likely Exposure NC - Not Calculated or no dose-response value NCOPC - Not a constituent of potential concern in this area/medium PCBs - Polychlorinated Biphenyls SVOCs - Semivolatile Organic Compounds TCDD TEQ - Tetrachlorodibenzo p-dioxin Toxic Equivalents Concentration VOCs - Volatile Organic Compounds																				

TABLE 6.16  
TOTAL POTENTIAL HAZARD INDEX  
CONSTRUCTION/UTILITY WORKER MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RVFS

Constituent	Q Central			Q South			R				S			
	Combined Soil		Total HQ	Combined Soil		Total HQ	Combined Soil		Leachate		Total HQ	Combined Soil		Total HQ
	Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation	Ing/Derm	Inhalation				
VOCs														
1 1 2 Trichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	2 33E-05	NC	NCOPC	NCOPC	2 33E-05	NCOPC	NCOPC	NC
1 2 Dichloroethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4 63E-05	4 97E-03	1 11E-02	2 53E+00	2 54E+00	NCOPC	NCOPC	NC
1 2 Dichloroethane (total)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1 70E-05	NC	4 88E-03	NC	4 80E-03	NCOPC	NCOPC	NC
2 Butanone (MEK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	2 23E-05	1 59E-03	1 81E-03	NCOPC	NCOPC	NC
4 Methyl 2 pentanone (MIBK)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	7 11E-06	2 74E-04	3 45E-04
Acetone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	4 32E-04	NC	4 32E-04	NCOPC	NCOPC	NC
Benzene	NCOPC	NCOPC	NC	2 01E-06	2 52E-04	2 54E-04	3 93E-04	1 32E-03	5 14E-02	5 77E-02	1 11E-01	1 77E-04	5 92E-04	7 69E-04
Chlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	6 42E-04	3 09E-03	1 80E-03	5 08E-03	1 06E-02	7 30E-04	3 54E-03	4 27E-03
Chloroform	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1 54E-05	7 23E-05	1 36E-03	1 03E-02	1 17E-02	NCOPC	NCOPC	NC
Chloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Dichloromethane	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1 80E-04	1 80E-04	3 80E-04	1 59E-05	1 31E-05	2 90E-05
Ethylbenzene	NCOPC	NCOPC	NC	7 47E-06	3 81E-04	3 89E-04	4 98E-06	5 56E-06	NCOPC	NCOPC	1 06E-05	1 86E-04	1 90E-04	3 56E-04
Tetrachloroethene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1 24E-03	3 98E-04	1 07E-01	1 26E-02	1 21E-01	7 14E-05	2 32E-05	9 48E-05
Toluene	NCOPC	NCOPC	NC	1 79E-05	6 87E-03	6 89E-03	4 91E-05	4 78E-04	3 19E-03	1 23E-02	1 60E-02	3 71E-04	3 83E-03	4 00E-03
Trichloroethylene	NCOPC	NCOPC	NC	4 01E-06	3 19E-05	3 59E-05	4 65E-02	2 44E-02	5 72E+00	9 09E-01	6 70E+00	9 93E-03	5 26E-03	1 52E-02
Xylenes Total	NCOPC	NCOPC	NC	2 85E-05	2 89E-02	2 90E-02	1 28E-05	3 82E-04	NCOPC	NCOPC	3 74E-04	4 91E-04	1 38E-02	1 43E-02
SVOCs														
1 2 Dichlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
1 3-Dichlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	2 07E-04	8 35E-09	2 07E-04
1 4 Dichlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4 62E-06	5 20E-09	NCOPC	NCOPC	4 62E-06	7 16E-05	9 82E-08	7 17E-05
2 4 6-Trichlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4 04E-02	NC	NCOPC	NCOPC	4 04E-02	1 87E-03	NC	1 67E-03
2 4 Dichlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	8 01E-03	NC	NCOPC	NCOPC	8 01E-03	NCOPC	NCOPC	NC
2 4-Dimethylphenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2 Chlorophenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	4 11E-04	NC	1 80E-02	NCOPC	1 84E-02	NCOPC	NCOPC	NC
2-Methylnaphthalene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2 Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	1 50E-05	NCOPC	NCOPC	1 50E-05	NC	2 13E-05	2 13E-05
3-Methylphenol/4 Methylphenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	8 76E-04	NCOPC	8 76E-04	NCOPC	NCOPC	NC
4 Chloroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	5 37E-02	NCOPC	5 37E-02	NCOPC	NCOPC	NC
4 Nitroaniline	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	7 56E-05	2 03E-06	1 83E-02	NCOPC	1 84E-02	3 55E-04	9 87E-06	3 65E-04
Benzo(a)anthracene	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
Benzo(a)pyrene	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
Benzo(b)fluoranthene	NC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
Benzo(g,h,i)perylene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1 83E-01	NCOPC	1 83E-01	NCOPC	NCOPC	NC
Benzo(k)fluoranthene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
bis(2-Chloroethyl)ether	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
bis(2-Ethylhexyl)phthalate	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	1 31E-04	NC	1 31E-04
Dibenz(a,h)anthracene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC
Hexachlorobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Indeno(1 2 3-cd)pyrene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Naphthalene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	3 75E-05	7 69E-06	NCOPC	NCOPC	4 52E-06	5 76E-05	1 38E-05	8 14E-05
Nitrobenzene	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	7 30E-04	5 56E-06	NCOPC	NCOPC	7 37E-04	NCOPC	NCOPC	NC
Phenol	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1 88E-02	NCOPC	1 88E-02	NCOPC	NCOPC	NC
Pesticides														
4 4 DDE	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4 4 DDT	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1 18E-01	NCOPC	1 18E-01	3 11E-04	NC	3 11E-04
Aldrin	3 47E-05	NC	3 47E-05	7 20E-05	NC	7 20E-05	NCOPC	NCOPC	NCOPC	NCOPC	NC	1 11E-04	NC	1 11E-04
alpha-BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
beta-BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	8 40E-06	NC	7 62E-03	NCOPC	7 69E-03	8 03E-04	NC	8 03E-04
delta-BHC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Dieldrin	7 72E-05	NC	7 72E-05	1 48E-04	NC	1 48E-04	3 75E-04	NC	4 34E-02	NCOPC	4 38E-02	1 25E-04	NC	1 25E-04
Endrin Ketone	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
gamma-BHC (Lindane)	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	9 48E-04	NCOPC	9 48E-04	2 34E-04	NC	2 34E-04
Heptachlor	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	2 06E-05	NC	3 43E-03	NCOPC	3 48E-03	3 00E-06	NC	3 00E-06
Heptachlor epoxide	NCOPC	NCOPC	NC	1 59E-04	NC	1 59E-04	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Herbicides														
2 4 5-T	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
2 4 D	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	2 47E-03	NCOPC	2 47E-03	NCOPC	NCOPC	NC
MCPA	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
MCPP	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	2 87E-03	NC	NCOPC	NCOPC	2 87E-03	NCOPC	NCOPC	NC
Pentachloropheno	2 99E-06	NC	2 99E-06	6 55E-05	NC	6 55E-05	NCOPC	NCOPC	NCOPC	NCOPC	NC	2 10E-04	NC	2 10E-04

TABLE 5-16  
TOTAL POTENTIAL HAZARD INDEX  
CONSTRUCTION/UTILITY WORKER MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RUFFS

Constituent	Q Central			Q South			R			S		
	Combined Soil		Total HQ	Combined Soil		Total HQ	Combined Soil		Total HQ	Combined Soil		Total HQ
	Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation		Ing/Derm	Inhalation	
<b>PCBs</b>												
Total PCBs	7.36E-03	NC	7.36E-03	1.74E-02	NC	1.74E-02	1.27E-01	NC	1.02E+02	NCOPC	1.02E+02	5.40E-01
Dioxin	NC	NC	NC	NC	NC	NC	NC	NC	NC	NCOPC	NC	NC
2,3,7,8 TCDD TEQ	NC	NC	NC	NC	NC	NC	NC	NC	NC	NCOPC	NC	NC
<b>Metals</b>												
Antimony	NCOPC	NCOPC	NC	1.54E-03	NC	1.54E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC
Arsenic	7.62E-04	NC	7.62E-04	8.79E-04	NC	8.79E-04	3.17E-04	NC	NCOPC	NCOPC	3.17E-04	NCOPC
Barium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC
Beryllium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.77E-04	NCOPC	1.77E-04	NCOPC
Cadmium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC
Chromium	NCOPC	NCOPC	NC	4.42E-04	1.74E-03	2.18E-03	NCOPC	NCOPC	3.88E-03	NCOPC	3.88E-03	8.90E-04
Cobalt	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.61E-04	NCOPC	1.61E-04	NCOPC
Copper	3.16E-03	NC	3.16E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC
Lead	NCOPC	NCOPC	NC	NC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC
Manganese	1.93E-03	3.32E-02	3.51E-02	1.61E-03	2.77E-02	2.93E-02	NCOPC	NCOPC	2.11E-02	NCOPC	2.11E-02	NCOPC
Mercury	NCOPC	NCOPC	NC	8.90E-04	1.69E-05	9.07E-04	8.66E-02	1.66E-03	7.33E-04	NCOPC	8.90E-02	NCOPC
Nickel	NCOPC	NCOPC	NC	9.60E-04	NC	9.60E-04	NCOPC	NCOPC	3.35E-04	NCOPC	3.35E-04	NCOPC
Thallium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.95E-03	NCOPC	1.95E-03	NCOPC
Vanadium	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.04E-04	NCOPC	1.04E-04	NCOPC
Zinc	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	9.09E-04	NCOPC	9.09E-04	NCOPC
<b>Total HI</b>	<b>1.33E-02</b>	<b>3.32E-02</b>	<b>4.65E-02</b>	<b>2.40E-02</b>	<b>8.57E-02</b>	<b>8.67E-02</b>	<b>3.13E-01</b>	<b>3.68E-02</b>	<b>1.08E+02</b>	<b>3.54E+00</b>	<b>1.12E+02</b>	<b>5.57E-01</b>
<b>Notes</b> Ing/Derm Ingestion/Dermal Contact HI Hazard Index HQ Hazard Quotient MLE Most Likely Exposure NC Not Calculated or no dose-response value NCOPC Not a constituent of potential concern in this area/medium PCBs Polychlorinated Biphenyls SVOCs Semivolatile Organic Compounds TCDD TEQ Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration VOCs Volatile Organic Compounds												

TABLE 6-17  
TOTAL POTENTIAL CARCINOGENIC RISK  
TRESPASSING TEENAGER - MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/FS

Constituent	O				O North				P			Q North				Q Central			
	Surface Soil		AA-O-1-16	Total	Surface Soil		Leachate	Total	Surface Soil		Total	Surface Soil		Leachate	Total	Surface Soil		Total	
	Ing/Derm	Inhalation	Inhalation	Risk	Ing/Derm	Inhalation	Inhalation	Risk	Ing/Derm	Inhalation	Risk	Ing/Derm	Inhalation	Inhalation	Risk	Ing/Derm	Inhalation	Risk	
VOCs																			
1,1,2-Trichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
1,2-Dichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
1,2-Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
4-Methyl 2-pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	
Acetone	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	
Benzene	NCOPC	1.23E-08	NCOPC	1.23E-08	NCOPC	7.52E-09	1.65E-10	7.68E-09	NCOPC	2.38E-10	2.38E-10	NCOPC	1.43E-10	7.15E-11	2.15E-10	NCOPC	NCOPC	NC	
Chlorobenzene	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	
Chloroform	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Chloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Dichloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	1.37E-09	NCOPC	1.37E-09	NCOPC	NCOPC	NC	NCOPC	NCOPC	1.25E-12	1.25E-12	NCOPC	NCOPC	NC	
Ethylbenzene	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	
Tetrachloroethene	NCOPC	NCOPC	NCOPC	NC	NCOPC	1.70E-09	NCOPC	1.70E-09	NCOPC	1.25E-08	1.25E-08	NCOPC	1.10E-09	7.50E-11	1.18E-09	NCOPC	NCOPC	NC	
Toluene	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Trichloroethylene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	3.72E-09	3.72E-09	NCOPC	1.14E-09	8.29E-10	1.97E-09	NCOPC	NCOPC	NC	
Xylenes Total	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	
SVOs																			
2,4,6-Trichlorophenol	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
2,4-Dichlorophenol	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
2-Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
4-Chloroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
4-Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Benzo(a)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Benzo(a)pyrene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	4.77E-09	3.03E-13	4.77E-09	1.97E-08	1.25E-12	NCOPC	1.97E-08	NCOPC	NCOPC	NC	
Benzo(b)fluoranthene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	3.36E-09	2.14E-13	NCOPC	3.36E-09	NCOPC	NCOPC	NC	
Pesticides																			
4,4-DDT	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
beta-BHC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Dieldrin	8.99E-09	4.75E-13	NCOPC	8.99E-09	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
gamma-BHC (Lindane)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Heptachlor	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Herbicides																			
MCPA	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
MCPP	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Pentachlorophenol	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
PCBs																			
Total PCBs	8.29E-08	3.50E-12	NCOPC	8.29E-08	8.27E-08	3.06E-10	NCOPC	8.27E-08	2.08E-08	1.16E-12	2.08E-08	8.68E-09	3.72E-13	NCOPC	6.68E-09	1.26E-08	7.00E-13	1.26E-08	
Dioxin																			
2,3,7,8-TCDD-TEQ	1.47E-08	8.00E-11	NCOPC	1.47E-08	2.49E-05	9.05E-10	NCOPC	2.49E-05	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	5.58E-07	3.04E-11	5.58E-07	
Metals																			
Antimony	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Arsenic	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	3.82E-08	6.91E-11	3.83E-08	NCOPC	NCOPC	NCOPC	NC	1.98E-08	3.58E-11	1.98E-08	
Cadmium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	4.12E-11	NCOPC	4.12E-11	NCOPC	NCOPC	NC	
Chromium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Lead	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Manganese	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Mercury	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Total	1.54E-06	1.24E-08	NC	1.54E-06	3.32E-05	1.18E-08	1.65E-10	3.32E-05	8.38E-08	1.65E-08	8.64E-08	2.97E-08	3.23E-09	3.14E-09	3.81E-08	5.90E-07	6.69E-11	8.90E-07	
Notes																			
Ing/Derm - Ingestion/Dermal Contact																			
MLE - Most Likely Exposure																			
NC - Not Calculated or no dose-response value																			
NCOPC - Not a constituent of potential concern in this area/medium																			
PCBs - Polychlorinated Biphenyls																			
SVOs - Semivolatile Organic Compounds																			
SW - Surface Water																			
TCDD - TEQ - Tetrachlorodibenzo-p-dioxin																			
Toxic Equivalents Concentration																			
VOCs - Volatile Organic Compounds																			

TABLE 6-17  
TOTAL POTENTIAL CARCINOGENIC RISK  
TRESPASSING TEENAGER - MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RVFS

Constituent	G South					R					S			River		
	Surface Soil		AA-C-4-24		Total Risk	Surface Soil		AA-R-1-25		Total Risk	Surface Soil		Total Risk	SW	Sediment	Total HQ
	Ing/Derm	Inhalation	Inhalation	Ing/Derm		Ing/Derm	Inhalation	Inhalation	Leachate		Ing/Derm	Inhalation				
VOGs																
1,1,2-Trichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	3.60E-10	NCOPC	NCOPC	NC	3.60E-10	NCOPC	NCOPC	NC	NCOPC	NCOPC
1,2-Dichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	3.25E-09	NCOPC	4.33E-08	4.33E-08	4.66E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC
1,2-Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC	NCOPC	NCOPC
Acetone	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC
Benzene	NCOPC	2.75E-11	7.34E-11	NCOPC	1.01E-10	NCOPC	4.40E-10	3.30E-13	1.05E-09	1.05E-09	1.49E-09	NCOPC	2.02E-10	2.02E-10	NCOPC	NCOPC
Chlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NC	NC	NCOPC	NCOPC
Chloroform	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	2.78E-10	NCOPC	1.77E-09	1.77E-09	2.05E-09	NCOPC	NCOPC	NC	NCOPC	NCOPC
Chloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	2.55E-14	2.55E-14	2.55E-14	NCOPC	NCOPC	NC	NCOPC	NCOPC
Dichloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	4.31E-11	4.31E-11	4.31E-11	NCOPC	9.79E-11	9.79E-11	NCOPC	NCOPC
Ethylbenzene	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC	NCOPC	NCOPC
Tetrachloroethene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	7.00E-09	NCOPC	2.80E-08	2.80E-08	3.50E-08	NCOPC	4.20E-10	4.20E-10	NCOPC	NCOPC
Toluene	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NC	NC	NCOPC	NCOPC
Trichloroethylene	NCOPC	2.38E-10	NCOPC	NCOPC	2.38E-10	NCOPC	4.95E-07	NCOPC	4.88E-06	4.88E-06	5.35E-06	NCOPC	1.05E-07	1.05E-07	NCOPC	NCOPC
Xylenes Total	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC	NCOPC	NCOPC
SVOCs																
2,4,6-Trichlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.88E-10	1.48E-14	2.88E-10	NCOPC	NCOPC
2,4-Dichlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC	NCOPC	NCOPC
2-Nitroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NCOPC
4-Chloroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC
4-Nitroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NCOPC
Benzo(a)anthracene	8.83E-10	5.61E-14	NCOPC	NCOPC	8.83E-10	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	6.42E-09	4.07E-13	6.42E-09	NCOPC	NCOPC
Benzo(a)pyrene	9.49E-09	6.02E-13	NCOPC	NCOPC	9.49E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	4.38E-08	2.78E-12	4.38E-08	NCOPC	NCOPC
Benzo(b)fluoranthene	1.15E-08	7.31E-14	NCOPC	NCOPC	1.15E-08	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	5.42E-08	3.44E-13	5.42E-08	NCOPC	NCOPC
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.57E-08	9.99E-13	1.57E-08	NCOPC	NCOPC
Pesticides																
4,4-DDT	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.68E-08	8.82E-13	1.68E-08	NCOPC	NCOPC
beta-BHC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.45E-07	7.83E-12	1.45E-07	NCOPC	NCOPC
Dieldrin	7.67E-09	4.16E-13	NCOPC	NCOPC	7.67E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC
gamma-BHC (Lindane)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	3.01E-08	NC	3.01E-08	NCOPC	NCOPC
Heptachlor	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.09E-08	1.11E-12	2.09E-08	NCOPC	NCOPC
Herbicides																
MCPA	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC	NCOPC
MCPP	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC	NCOPC
Pentachlorophenol	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.63E-07	NC	1.63E-07	NCOPC	NCOPC
PCBs																
Total PCBs	3.21E-08	1.78E-12	NCOPC	NCOPC	3.21E-08	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	5.88E-06	3.27E-10	5.88E-06	NCOPC	NCOPC
Dioxin																
2,3,7,8-TCDD TEQ	3.38E-07	1.85E-11	NCOPC	NCOPC	3.38E-07	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC
Metals																
Antimony	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC
Arsenic	2.62E-08	4.74E-11	NCOPC	NCOPC	2.62E-08	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	5.87E-09
Cadmium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC
Chromium	NC	1.15E-09	NCOPC	NCOPC	1.15E-09	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC
Lead	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC
Manganese	NC	NC	NCOPC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC
Mercury	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC
Total	4.16E-07	1.48E-09	7.34E-11	NC	4.16E-07	NC	5.07E-07	3.56E-13	4.93E-06	4.93E-06	6.44E-06	6.33E-06	1.06E-07	6.44E-06	NC	5.87E-09
Notes	<p>Ing/Derm - Ingestion/Dermal Contact MLE - Most Likely Exposure NC - Not Calculated or no dose-response value NCOPC - Not a constituent of potential concern in this area/medium PCBs - Polychlorinated Biphenyls SVOCs - Semivolatile Organic Compounds SW - Surface Water TCDD TEQ - Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration VOGs - Volatile Organic Compounds</p>															

TABLE 6.18  
TOTAL POTENTIAL HAZARD INDEX  
TRESPASSING TEENAGER MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RIFS

Constituent	O				O North				P				Q North				Q Central			
	Surface Soil		AA-Q-1.16		Surface Soil		Leachate		Surface Soil		Total		Surface Soil		Leachate		Surface Soil		Total	
	Ing/Derm	Inhalation	Inhalation	Total HQ	Ing/Derm	Inhalation	Inhalation	Total HQ	Ing/Derm	Inhalation	Total HQ		Ing/Derm	Inhalation	Inhalation	Total HQ	Ing/Derm	Inhalation	Total HQ	
VOCs																				
1,1,2-Trichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
1,2-Dichloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
1,2-Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
2-Butanone (MEK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
4-Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	6.54E-08	6.54E-08	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	8.66E-08	8.66E-08	NCOPC	NCOPC	NC
Acetone	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Benzene	NCOPC	1.18E-03	NCOPC	1.18E-03	NCOPC	7.25E-04	1.59E-06	7.41E-04	NCOPC	2.30E-05	2.30E-05		NCOPC	1.38E-06	8.90E-06	2.07E-05	NCOPC	NCOPC	NC	
Chlorobenzene	NCOPC	1.34E-03	NCOPC	1.34E-03	NCOPC	2.78E-03	1.07E-06	2.77E-03	NCOPC	NCOPC	NC		NCOPC	8.42E-06	8.42E-06	8.42E-06	NCOPC	NCOPC	NC	
Chloroform	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Chloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Dichloromethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	8.17E-06	NCOPC	8.17E-06	NCOPC	NCOPC	NC		NCOPC	NCOPC	5.64E-09	5.64E-09	NCOPC	NCOPC	NC	
Ethylbenzene	NCOPC	1.75E-04	NCOPC	1.75E-04	NCOPC	2.54E-04	NCOPC	2.54E-04	NCOPC	7.42E-08	7.42E-08		NCOPC	2.12E-08	NCOPC	2.12E-08	NCOPC	NCOPC	NC	
Tetrachloroethane	NCOPC	NCOPC	NCOPC	NC	NCOPC	3.03E-06	NCOPC	3.03E-06	NCOPC	2.23E-06	2.23E-06		NCOPC	1.96E-08	1.34E-07	2.10E-06	NCOPC	NCOPC	NC	
Toluene	NCOPC	6.38E-06	NCOPC	6.38E-06	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Trichloroethylene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	5.91E-08	5.91E-08		NCOPC	1.82E-08	1.32E-08	3.14E-06	NCOPC	NCOPC	NC	
Xylenes Total	NCOPC	9.02E-03	NCOPC	9.02E-03	NCOPC	1.33E-02	NCOPC	1.33E-02	NCOPC	3.93E-04	3.93E-04		NCOPC	1.54E-04	NCOPC	1.54E-04	NCOPC	NCOPC	NC	
SVOCs																				
2,4,6-Trichloropheno	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
2,4-Dichloropheno	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
2-Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
4-Chloroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
4-Nitroaniline	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Benz(a)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NC		NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	
Benz(a)pyrene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NC		NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	
Benz(b)fluoranthene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Dibenz(a,h)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NC	NC	NCOPC	NC	NCOPC	NCOPC	NC	
PAHs																				
4,4'-DDT	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
beta-BHC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Dieldrin	7.15E-05	NC	NCOPC	7.15E-05	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
gamma-BHC (Lindane)	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Heptachlor	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Herbicides																				
MCPA	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
MCPP	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Pentachloropheno	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
PCBs																				
Total PCBs	1.00E-02	NC	NCOPC	1.00E-02	1.32E+00	NC	NCOPC	1.32E+00	3.31E-03	NC	3.31E-03		1.06E-03	NC	NCOPC	1.06E-03	2.00E-03	NC	2.00E-03	
Dioxin																				
2,3,7,8-TCDD TEQ	NC	NC	NCOPC	NC	NC	NC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	
Metals																				
Antimony	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Arsenic	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	5.41E-04	NC	5.41E-04		NCOPC	NCOPC	NCOPC	NC	2.80E-04	NC	2.80E-04	
Cadmium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		8.77E-04	NC	NCOPC	8.77E-04	NCOPC	NCOPC	NC	
Chromium	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Lead	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Manganese	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Mercury	NCOPC	NCOPC	NCOPC	NC	1.10E-02	8.89E-07	NCOPC	1.10E-02	NCOPC	NCOPC	NC		NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Total HQ	1.01E-02	1.18E-02	NC	2.19E-02	1.33E+00	1.70E-02	2.87E-05	1.34E+00	3.86E-03	4.51E-04	4.50E-03		1.04E-03	2.74E-04	1.73E-04	2.20E-03	2.20E-03	NC	2.20E-03	
Notes																				
Ing/Derm	Ingestion/Dermal Contact																			
HQ	Hazard Index																			
MQ	Maximum Quotient																			
MLE	Most Likely Exposure																			
NC	Not Calculated or no dose response value																			
NCOPC	Not a constituent of potential concern in this area/medium																			
PCBs	Polychlorinated Biphenyls																			
SVOCs	Semi-volatile Organic Compounds																			
SW	Surface Water																			
TCDD TEQ	Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration																			
VOCs	Volatile Organic Compounds																			

TABLE 18  
TOTAL POTENTIAL HAZARD INDEX  
TRESPASSING TEENAGER MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/Fs

Constituent	Q South					R					S					River		
	Surface Soil		AA-A 4-3d	Pond SW	Total	Surface Soil		AA-R 1-3f	Leachate	Max Value	Total	Surface Soil		Total	SW	Sediment	Total	
	Ing/Derm	Inhalation	Inhalation	Ing/Derm	HQ	Ing/Derm	Inhalation	Inhalation	Inhalation	Inhalation	HQ	Ing/Derm	Inhalation	HQ	Ing/Derm	Ing/Derm	HQ	
VOCs																		
1,1,2 Trichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
1,2 Dichloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	1.62E-04	NCOPC	2.17E-03	2.17E-03	2.33E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
1,2 Dichloroethane (total)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
2 Butanone (MEK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	3.87E-07	3.87E-07	3.87E-07	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
4 Methyl-2-pentanone (MIBK)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	9.02E-06	9.02E-06	NCOPC	NCOPC	NC	
Acetone	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Benzene	NCOPC	2.88E-06	7.07E-06	NCOPC	9.73E-06	NCOPC	4.24E-06	3.18E-06	1.01E-04	1.01E-04	1.43E-04	NCOPC	1.96E-06	1.96E-06	NCOPC	NCOPC	NC	
Chlorobenzene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	9.81E-05	5.17E-06	6.51E-06	6.51E-06	1.05E-04	NCOPC	1.18E-04	1.18E-04	NCOPC	NCOPC	NC	
Chloroform	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	2.33E-06	NCOPC	1.48E-06	1.48E-06	1.72E-06	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Chloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	1.00E-09	1.00E-09	1.00E-09	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Dichloromethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	1.94E-07	1.94E-07	1.94E-07	NCOPC	4.41E-07	4.41E-07	NCOPC	NCOPC	NC	
Ethylbenzene	NCOPC	8.48E-06	NCOPC	NCOPC	8.48E-06	NCOPC	1.65E-07	NCOPC	NCOPC	NC	1.96E-07	NCOPC	6.38E-06	6.38E-06	NCOPC	NCOPC	NC	
Tetrachloroethane	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	1.25E-06	NCOPC	4.99E-05	4.99E-05	6.24E-05	NCOPC	7.49E-07	7.49E-07	NCOPC	NCOPC	NC	
Toluene	NCOPC	9.97E-05	NCOPC	NCOPC	9.97E-05	NCOPC	1.60E-06	NCOPC	2.53E-05	2.53E-05	4.12E-06	NCOPC	1.16E-04	1.16E-04	NCOPC	NCOPC	NC	
Trichloroethylene	NCOPC	3.79E-07	NCOPC	NCOPC	3.79E-07	NCOPC	7.68E-04	NCOPC	7.73E-03	7.73E-03	8.52E-03	NCOPC	1.67E-04	1.67E-04	NCOPC	NCOPC	NC	
Xylenes Total	NCOPC	5.84E-04	NCOPC	NCOPC	5.84E-04	NCOPC	1.17E-05	NCOPC	NCOPC	NC	1.17E-05	NCOPC	4.46E-04	4.46E-04	NCOPC	NCOPC	NC	
SVOCs																		
2,4,6 Trichloropheno	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.65E-03	NC	1.65E-03	NCOPC	NCOPC	NC	
2,4 Dichloropheno	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	1.17E-04	NCOPC	1.17E-04	
2 Nitroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	1.00E-07	1.00E-07	NCOPC	NCOPC	NC	
4 Chloroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	5.37E-06	NCOPC	5.37E-06	
4 Nitroaniline	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	3.80E-04	5.25E-06	3.80E-04	NCOPC	NCOPC	NC	
Benzo(a)anthracene	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	
Benzo(a)pyrene	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	
Benzo(b)fluoranthene	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NC	NC	NC	NCOPC	NCOPC	NC	
Pesticides																		
4,4 DDT	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	6.29E-04	NC	6.29E-04	NCOPC	NCOPC	NC	
beta BHC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	1.70E-03	NC	1.70E-03	NCOPC	NCOPC	NC	
Dieldrin	6.25E-05	NC	NCOPC	NCOPC	6.25E-05	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
gamma BHC (Lindane)	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	4.91E-04	NC	4.91E-04	NCOPC	NCOPC	NC	
Heptachlor	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	5.90E-05	NC	5.90E-05	NCOPC	NCOPC	NC	
Herbicides																		
MCPA	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	3.85E-03	NCOPC	3.65E-03	
MCPP	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	2.14E-03	NCOPC	2.14E-03	
Pentachloropheno	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	2.88E-04	NC	2.88E-04	NCOPC	NCOPC	NC	
PCBs																		
Total PCBs	5.10E-03	NC	NCOPC	NCOPC	5.10E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	9.36E-01	NC	9.36E-01	NCOPC	NCOPC	NC	
Dioxin																		
2,3,7,8 TCDD TEQ	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Metals																		
Antimony	6.76E-04	NC	NCOPC	NCOPC	6.76E-04	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Arsenic	3.71E-04	NC	NCOPC	NCOPC	3.71E-04	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	8.31E-05	8.31E-05	
Cadmium	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Chromium	3.16E-04	6.07E-06	NCOPC	NCOPC	3.25E-04	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Lead	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Manganese	9.86E-04	8.73E-06	NCOPC	1.15E-04	1.19E-03	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Mercury	NCOPC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	
Total HQ	7.52E-03	7.66E-04	7.07E-06	1.15E-04	6.43E-03	NC	1.13E-03	8.45E-06	1.01E-02	1.01E-02	1.12E-02	9.41E-01	8.60E-04	8.42E-01	5.90E-03	8.31E-05	6.04E-03	
Notes																		
Ing/Derm	Ingestion/Dermal Contact																	
HI	Hazard Index																	
HQ	Hazard Quotient																	
MLE	Most Likely Exposure																	
NC	Not Calculated or no dose-response value																	
NCOPC	Not a constituent of potential concern in this area/medium																	
PCBs	Polychlorinated Biphenyls																	
SVOCs	Semivolatile Organic Compounds																	
SW	Surface Water																	
TCDD TEQ	Tetrachlorodibenzo-p-dioxin																	
Toxic Equivalents Concentration																		
VOCs	Volatile Organic Compounds																	

TABLE 6-19  
TOTAL POTENTIAL CARCINOGENIC RISK  
RECREATIONAL FISHER - MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RIFS

Constituent	Mississippi River - UDA				Mississippi River - PDA				Mississippi River - DDA				Pond (Site Q South)			Pond (Site Q South)		
	Buffalo Filter	SW	Sediment	Total	Buffalo Filter	SW	Sediment	Total	Buffalo Filter	SW	Sediment	Total	Black Bullhead Filter	Surface Water	Total	Carp Filter	Surface Water	Total
	Ingestion	Ing/Derm	Ing/Derm	Risk	Ingestion	Ing/Derm	Ing/Derm	Risk	Ingestion	Ing/Derm	Ing/Derm	Risk	Ingestion	Ing/Derm	HQ	Ingestion	Ing/Derm	HQ
<b>SVOCs</b>																		
2,4-Dichloropheno	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4-Chloroaniline	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Benzo(a)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1.88E-07	NCOPC	1.88E-07
Benzo(a)pyrene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	2.41E-06	NCOPC	2.41E-06
ba(2-Ethylhexyl)phthalat	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1.29E-08	NCOPC	1.29E-08
Dibenzo(a,h)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	1.88E-06	NCOPC	1.88E-06
<b>Pesticides</b>																		
4,4'-DDE	1.06E-08	NCOPC	NCOPC	1.06E-08	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4,4'-DDT	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	2.25E-07	NCOPC	2.25E-07	2.06E-07	NCOPC	2.06E-07
alpha-Chlordane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	5.43E-09	NCOPC	5.43E-09	1.03E-08	NCOPC	1.03E-08
beta-BHC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	5.62E-08	NCOPC	5.62E-08
Dieldrin	2.38E-07	NCOPC	NCOPC	2.38E-07	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	2.94E-06	NCOPC	2.94E-06	5.58E-06	NCOPC	5.58E-06
<b>Herbicides</b>																		
MCPA	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
MCPP	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
<b>PCBs</b>																		
Total PCBs	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	1.42E-05	NCOPC	1.42E-05	3.87E-05	NCOPC	3.87E-05
Dioxin																		
2,3,7,8-TCDD-TEQ	1.26E-06	NCOPC	NCOPC	1.26E-06	1.45E-07	NCOPC	NCOPC	1.45E-07	2.04E-07	NCOPC	NCOPC	2.04E-07	1.08E-06	NCOPC	1.08E-06	5.07E-06	NCOPC	5.07E-06
<b>Metals</b>																		
Arsenic	NCOPC	NCOPC	1.44E-08	1.44E-08	NCOPC	NCOPC	1.44E-08	1.44E-08	NCOPC	NCOPC	1.44E-08	1.44E-08	2.15E-06	NCOPC	2.15E-06	2.26E-06	NCOPC	2.26E-06
Lead	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NC
Manganese	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NC
Mercury	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC	NCOPC	NC
<b>Total</b>	<b>1.51E-06</b>	<b>NC</b>	<b>1.44E-08</b>	<b>1.51E-06</b>	<b>1.45E-07</b>	<b>NC</b>	<b>1.44E-08</b>	<b>1.45E-07</b>	<b>2.04E-07</b>	<b>NC</b>	<b>1.44E-08</b>	<b>2.04E-07</b>	<b>2.08E-05</b>	<b>NC</b>	<b>2.04E-05</b>	<b>5.44E-05</b>	<b>NC</b>	<b>5.44E-05</b>
<b>Notes</b> DDA - Downstream Discharge Area (Mississippi River) Ing/Derm - Ingestion/Dermal Contact MLE - Most Likely Exposure NC - Not Calculated or no dose-response value NCOPC - Not a constituent of potential concern in this area/medium PCBs - Polychlorinated Biphenyls PDA - Plume Discharge Area (Mississippi River) SVOCs - Semivolatile Organic Compounds TCDD - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration UDA - Upstream Discharge Area (Mississippi River) VOCs - Volatile Organic Compounds																		

TABLE 8.20  
TOTAL POTENTIAL HAZARD INDEX  
RECREATIONAL FISHER MLE  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/F/S

Constituent	Mississippi River - UDA				Mississippi River - PDA				Mississippi River - DDA				Pond (Site Q South)			Pond (Site Q South)		
	Buffalo Fillet	SW	Sediment	Total	Buffalo Fillet	SW	Sediment	Total	Buffalo Fillet	SW	Sediment	Total	Black Bullhead Fillet	Surface Water	Total	Carg Fillet	Surface Water	Total
	Ingestion	Ing/Derm	Ing/Derm	Risk	Ingestion	Ing/Derm	Ing/Derm	Risk	Ingestion	Ing/Derm	Ing/Derm	Risk	Ingestion	Ing/Derm	HQ	Ingestion	Ing/Derm	HQ
SVOCs																		
2,4-Dichloropheno	NCOPC	3.87E-05	NCOPC	3.87E-05	NCOPC	3.87E-05	NCOPC	3.87E-05	NCOPC	3.87E-05	NCOPC	3.87E-05	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4-Chloroaniline	NCOPC	1.75E-05	NCOPC	1.75E-05	NCOPC	1.75E-05	NCOPC	1.75E-05	NCOPC	1.75E-05	NCOPC	1.75E-05	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
Benzo(a)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC
Benzo(a)pyrene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC
bis(2-Ethylhexyl)phthalat	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	3.57E-04	NCOPC	3.57E-04
Dibenz(a,h)anthracene	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC
Pesticides																		
4,4-DOE	4.86E-04	NCOPC	NCOPC	4.86E-04	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
4,4-DDT	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	1.03E-02	NCOPC	1.03E-02	9.43E-03	NCOPC	9.43E-03
alpha-Chlordane	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	2.86E-04	NCOPC	2.86E-04	4.57E-04	NCOPC	4.57E-04
beta-BHC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC	8.10E-04	NCOPC	8.10E-04
Dieldrin	2.31E-03	NCOPC	NCOPC	2.31E-03	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	2.86E-02	NCOPC	2.86E-02	5.43E-02	NCOPC	5.43E-02
Herbicides																		
MCPA	NCOPC	1.20E-03	NCOPC	1.20E-03	NCOPC	1.20E-03	NCOPC	1.20E-03	NCOPC	1.20E-03	NCOPC	1.20E-03	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
MCPB	NCOPC	7.04E-04	NCOPC	7.04E-04	NCOPC	7.04E-04	NCOPC	7.04E-04	NCOPC	7.04E-04	NCOPC	7.04E-04	NCOPC	NCOPC	NC	NCOPC	NCOPC	NC
PCBs																		
Total PCBs	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	2.76E+00	NCOPC	2.76E+00	7.14E+00	NCOPC	7.14E+00
Dioxin																		
2,3,7,8-TCDD TEQ	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NCOPC	NC	NC	NCOPC	NC	NC	NCOPC	NC
Metals																		
Arsenic	NCOPC	NCOPC	2.49E-05	2.49E-05	NCOPC	NCOPC	2.49E-05	2.49E-05	NCOPC	NCOPC	2.49E-05	2.49E-05	3.71E-02	NCOPC	3.71E-02	3.90E-02	NCOPC	3.90E-02
Lead	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NC	NC	NCOPC	NC	NC
Manganese	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	3.62E-05	3.62E-05	NCOPC	3.62E-05	3.62E-05
Mercury	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	NCOPC	NCOPC	NCOPC	NC	2.38E-02	NCOPC	2.38E-02	6.76E-03	NCOPC	6.76E-03
Total HQ	2.80E-03	1.80E-03	2.49E-05	4.76E-03	NC	1.80E-03	2.49E-05	1.80E-03	NC	1.80E-03	2.49E-05	1.80E-03	2.86E+00	3.62E-05	2.86E+00	7.29E+00	3.62E-05	7.29E+00
Notes: DDA: Downstream Discharge Area (Mississippi River) Ing/Derm: Ingestion/Dermal Contact HI: Hazard Index HQ: Hazard Quotient MLE: Most Likely Exposure NC: Not Calculated or no dose response value NCOPC: Not a constituent of potential concern in this area/medium PCBs: Polychlorinated Biphenyls PDA: Plume Discharge Area (Mississippi River) SVOCs: Semivolatile Organic Compounds TCDD TEQ: Tetrachlorodibenzo-p-dioxin Toxic Equivalent Concentration UDA: Upstream Discharge Area (Mississippi River) VOCs: Volatile Organic Compounds																		

TABLE 6-21  
SUMMARY OF POTENTIAL CARCINOGENIC RISKS FOR ALL RECEPTORS - SITES  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/VFS

Medium (Pathways)	Sites															
	O		O North		P		Q North		Q Central		Q South		Q Pond		R (a)	
	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE
<b>Indoor Industrial Worker (IW)</b>																
Groundwater/Leachate to Indoor Air (nh)	NCOPC	NCOPC	1.10E-08	1.92E-09	NC	NC	8.72E-09	1.83E-08	NC	NC	1.21E-06	2.12E-07	NA	NA	1.01E-07	1.77E-08
<b>Outdoor Industrial Worker (OW)</b>																
Surface Soil (ing/derm)	5.85E-05	5.14E-06	6.25E-04	1.12E-04	3.41E-06	2.32E-07	1.10E-06	1.03E-07	3.13E-05	1.98E-06	1.82E-05	1.41E-06	NA	NA	NCOPC	NC
Surface Soil to Outdoor Air (inh)	9.19E-06	3.09E-07	2.83E-06	2.96E-07	4.80E-06	4.13E-07	1.07E-06	8.07E-08	2.20E-06	1.87E-09	4.68E-07	3.70E-08	NA	NA	6.15E-04	1.27E-05
Groundwater/Leachate to Outdoor Air (inh)	NCOPC	NC	2.36E-06	4.12E-09	NC	NC	4.49E-07	7.85E-08	NC	NC	1.06E-06	1.83E-09	NA	NA	7.04E-04	1.23E-04
<b>Total Potential Risk</b>	<b>6.87E-05</b>	<b>5.45E-06</b>	<b>6.25E-04</b>	<b>1.13E-04</b>	<b>8.22E-06</b>	<b>6.45E-07</b>	<b>2.82E-06</b>	<b>2.82E-07</b>	<b>3.13E-05</b>	<b>1.98E-06</b>	<b>1.87E-05</b>	<b>1.45E-06</b>	NA	NA	<b>1.32E-03</b>	<b>1.36E-04</b>
<b>Construction/Utility Worker (CW)</b>																
Combined Soil (ing/derm)	8.44E-06	7.08E-07	1.26E-04	3.13E-05	2.36E-07	4.47E-08	2.80E-06	5.19E-07	8.94E-07	2.20E-07	1.15E-06	2.06E-07	NA	NA	3.56E-06	3.70E-07
Combined Soil to Outdoor Air (inh)	3.05E-06	1.81E-07	2.00E-06	3.87E-07	5.87E-07	8.55E-08	2.15E-07	2.99E-08	1.78E-08	3.47E-09	1.81E-07	3.51E-08	NA	NA	4.14E-05	1.43E-06
Groundwater (ing/derm)	1.36E-06	6.79E-07	7.81E-06	3.81E-06	NC	NC	6.96E-06	3.48E-06	NC	NC	NC	NC	NA	NA	1.77E-04	8.86E-06
Groundwater/Leachate to Outdoor Air (inh)	NCOPC	NCOPC	8.58E-08	2.57E-08	NC	NC	2.51E-06	7.52E-07	NC	NC	NC	NC	NA	NA	7.57E-04	2.27E-04
<b>Total Potential Risk</b>	<b>1.29E-05</b>	<b>1.57E-06</b>	<b>1.36E-04</b>	<b>3.55E-05</b>	<b>8.03E-07</b>	<b>1.30E-07</b>	<b>1.25E-06</b>	<b>4.78E-06</b>	<b>9.12E-07</b>	<b>2.23E-07</b>	<b>1.34E-06</b>	<b>2.41E-07</b>	NA	NA	<b>9.79E-04</b>	<b>3.17E-04</b>
<b>Travelling Teenager (TT)</b>																
Surface Soil (ing/derm)	1.06E-05	1.54E-06	1.17E-04	3.32E-05	6.21E-07	6.38E-08	2.04E-07	2.97E-08	5.86E-06	5.90E-07	3.41E-06	4.18E-07	NA	NA	NC	NC
Surface Soil to Outdoor Air (inh)	1.54E-07	1.24E-08	4.78E-06	1.18E-06	8.07E-08	1.65E-08	1.79E-08	3.23E-09	3.70E-10	6.69E-11	7.70E-09	1.48E-08	NA	NA	1.03E-05	5.07E-07
Groundwater/Leachate to Outdoor Air (inh)	NC	NC	3.99E-10	1.65E-10	NC	NC	7.55E-09	3.14E-09	NC	NC	1.76E-10	7.34E-11	NA	NA	1.18E-05	4.93E-06
Surface Water (ing/derm)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NC	NC
Sediment (ing/derm)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NC	NC
<b>Total Potential Risk</b>	<b>1.07E-05</b>	<b>1.55E-06</b>	<b>1.17E-04</b>	<b>3.32E-05</b>	<b>7.02E-07</b>	<b>8.04E-08</b>	<b>2.30E-07</b>	<b>3.61E-08</b>	<b>5.86E-06</b>	<b>5.90E-07</b>	<b>3.42E-06</b>	<b>4.18E-07</b>	NA	NA	<b>2.22E-05</b>	<b>5.44E-06</b>
<b>Recreational Fisher</b>																
Surface Water (ing/derm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NC	NA	NA
Fish Fillet: Black Bullhead Fillet (ing)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.49E-04	2.08E-05	NA	NA
Fish Fillet: Carp Fillet (ing)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.45E-03	5.44E-05	NA	NA
<b>Total Potential Risk (Black Bullhead Fillet)</b>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<b>5.49E-04</b>	<b>2.08E-05</b>	NA	NA
<b>Total Potential Risk (Carp Fillet)</b>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<b>1.45E-03</b>	<b>5.44E-05</b>	NA	NA
Notes derm: dermal contact ing: ingestion inh: inhalation MLE: Most Likely Exposure NA: Not Applicable: Receptor not assumed to be exposed via this pathway NC: Not Calculated: No constituents of potential concern were identified for this pathway NCOPC: No COPCs identified for this pathway RME: Reasonable Maximum Exposure (a) Site R has both a groundwater location and a leachate well in the mid-groundwater depth range. Potential inhalation exposures for receptors potentially exposed to mid depth groundwater (W, OW, TT) were calculated for both leachate and groundwater. The higher potential risk is shown here.																

TABLE 6-22  
SUMMARY OF POTENTIAL CARCINOGENIC RISKS FOR ALL RECEPTORS - MISSISSIPPI RIVER  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/FS

Medium (Pathways)	River							
	River		DDA		PDA		UDA	
	RME	MLE	RME	MLE	RME	MLE	RME	MLE
<b><u>Trespassing Teenager (TT)</u></b>								
Surface Water (ing/derm)	NC	NC	NC	NC	NC	NC	NC	NC
Sediment (ing/derm)	2.19E-08	5.87E-09	NC	NC	NC	NC	NC	NC
<b>Total Potential Risk:</b>	<b>2.19E-08</b>	<b>5.87E-09</b>	<b>NC</b>	<b>NC</b>	<b>NC</b>	<b>NC</b>	<b>NC</b>	<b>NC</b>
<b><u>Recreational Fisher</u></b>								
Surface Water (ing/derm)	NC	NC	NC	NC	NC	NC	NC	NC
Sediment (ing/derm)	NC	NC	6.97E-08	1.44E-09	6.97E-08	1.44E-09	6.97E-08	1.44E-09
Fish Fillet, Buffalo Fillet (ing)	NC	NC	4.02E-05	1.51E-06	4.59E-06	1.45E-07	5.43E-06	2.04E-07
<b>Total Potential Risk:</b>	<b>NC</b>	<b>NC</b>	<b>4.03E-05</b>	<b>1.51E-06</b>	<b>4.66E-06</b>	<b>1.46E-07</b>	<b>5.50E-06</b>	<b>2.05E-07</b>
Notes DDA - Downstream Discharge Area (Mississippi River) derm - dermal contact ing - ingestion inh - inhalation MLE - Maximum Likely Exposure NC - Not Calculated. No constituents of potential concern were identified for this pathway PDA - Plume Discharge Area (Mississippi River) RME - Reasonable Maximum Exposure UDA - Upstream Discharge Area (Mississippi River)								

TABLE 6-23  
SUMMARY OF POTENTIAL HAZARD INDICES FOR ALL RECEPTORS - SITES  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/F/S

Medium (Pathways)	Sites															
	O		O North		P		Q North		Q Central		Q South		Q Pond		R (a)	
	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE
<b>Indoor Industrial Worker (IW)</b>																
Groundwater/Leachate to Indoor Air (inh)	NCOPC	NCOPC	5.64E-04	3.65E-04	NC	NC	3.70E-04	2.31E-04	NC	NC	2.16E-03	1.35E-03	NA	NA	1.52E-03	9.48E-04
<b>Outdoor Industrial Worker (OW)</b>																
Surface Soil (ing/derm)	1.79E-01	5.57E-02	1.18E+01	7.33E+00	1.25E-01	2.15E-02	6.67E-02	1.08E-02	4.71E-02	1.27E-02	1.24E-01	4.23E-02	NA	NA	NCOPC	NCOPC
Surface Soil to Outdoor Air (inh)	4.00E+00	4.82E-01	1.59E+00	6.66E-01	2.43E-01	1.77E-02	3.10E-02	8.38E-03	NC	NC	1.23E-01	3.09E-02	NA	NA	4.73E-01	4.45E-02
Groundwater/Leachate to Outdoor Air (inh)	NCOPC	NCOPC	1.88E-03	1.06E-03	NC	NC	7.73E-03	4.83E-03	NC	NC	4.44E-04	2.78E-04	NA	NA	6.34E-01	3.98E-01
Total Potential Hazard Index	4.18E+00	5.18E-01	1.33E+01	8.00E+00	3.68E-01	3.92E-02	1.06E-01	2.40E-02	4.71E-02	1.27E-02	2.46E-01	7.35E-02	NA	NA	1.11E+00 (b)	4.41E-01
<b>Construction/Utility Worker (CW)</b>																
Combined Soil (ing/derm)	2.61E+00	2.21E-01	2.66E+01	5.90E+00	1.69E-01	1.78E-02	5.00E-01	9.66E-02	7.76E-02	1.33E-02	1.93E-01	2.40E-02	NA	NA	3.09E+00	3.13E-01
Combined Soil to Outdoor Air (inh)	1.88E+01	1.05E+00	5.10E+00	1.02E+00	4.08E-01	1.52E-02	1.28E-01	1.88E-02	1.70E-01	3.32E-02	4.36E-01	6.57E-02	NA	NA	8.10E-01	3.88E-02
Groundwater (ing/derm)	1.20E-03	5.96E-04	3.13E+00	1.66E+00	NC	NC	1.08E+01	5.32E+00	NC	NC	NC	NC	NA	NA	2.16E+02	1.08E+02
Groundwater/Leachate to Outdoor Air (inh)	NCOPC	NCOPC	4.82E-02	1.45E-02	NC	NC	3.90E-01	1.17E-01	NC	NC	NC	NC	NA	NA	1.18E+01	3.54E+00
Total Potential Hazard Index	2.14E+01	1.27E+00 (b)	3.48E+01	9.20E+00	5.79E-01	3.29E-02	1.17E+01	5.55E+00	2.47E-01	4.85E-02	6.29E-01	6.97E-02	NA	NA	2.32E+02	1.12E+02
<b>Travelling Teenager (TT)</b>																
Surface Soil (ing/derm)	7.48E-02	1.01E-02	4.90E+00	1.33E+00	5.21E-02	3.85E-03	2.78E-02	1.94E-03	1.90E-02	2.28E-03	5.16E-02	7.52E-03	NA	NA	NC	NC
Surface Soil to Outdoor Air (inh)	1.53E-01	1.18E-02	6.07E-02	1.70E-02	9.30E-03	4.51E-04	1.19E-03	2.14E-04	NC	NC	4.70E-03	7.88E-04	NA	NA	1.81E-02	1.13E-03
Groundwater/Leachate to Outdoor Air (inh)	NC	NC	5.40E-05	2.67E-05	NC	NC	2.95E-04	1.23E-04	NC	NC	1.70E-05	7.07E-06	NA	NA	2.42E-02	1.01E-02
Surface Water (ng/derm)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	2.13E-04	1.15E-04	NA	NA	NC	NC
Sediment (ng/derm)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NC	NC
Total Potential Hazard Index	2.27E-01	2.19E-02	4.97E+00	1.34E+00	6.14E-02	4.30E-03	2.93E-02	2.28E-03	1.94E-02	2.28E-03	5.85E-02	8.43E-03	NA	NA	4.23E-02	1.12E-02
<b>Recreational Fisher</b>																
Surface Water (ing/derm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.48E-04	3.82E-05	NA	NA
Fish Fillet: Black Bullhead Fillet (ing)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.29E+01	2.88E+00	NA	NA
Fish Fillet: Carp Fillet (ing)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.80E+01	7.25E+00	NA	NA
Total Potential Hazard Index (Black Bullhead Fillet)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.29E+01	2.88E+00	NA	NA
Total Potential Hazard Index (Carp Fillet)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.80E+01	7.25E+00	NA	NA
<b>Notes</b> derm: dermal contact ing: ingestion inh: inhalation MLE: Most Likely Exposure NA: Not Applicable. Receptor not assumed to be exposed via this pathway NC: Not Calculated. No constituents of potential concern were identified for this pathway RME: Reasonable Maximum Exposure (a) Site R has both a groundwater location and a leachate well in the mid-groundwater depth range. Potential inhalation exposures for receptors potentially exposed to mid depth groundwater (IW, OW, TT) were calculated for both leachate and groundwater. The higher potential risk is shown here. (b) Target endpoint analysis (Appendix N) indicates no target endpoint based HI exceedances.																

TABLE 6-24  
SUMMARY OF POTENTIAL HAZARD INDICES FOR ALL RECEPTORS - MISSISSIPPI RIVER  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/VS

Medium (Pathways)	River							
	River		DDA		PDA		UDA	
	RME	MLE	RME	MLE	RME	MLE	RME	MLE
<b><u>Trespassing Teenager (TT)</u></b>								
Surface Water (ing/derm)	1.12E-02	5.96E-03	NC	NC	NC	NC	NC	NC
Sediment (ing/derm)	3.10E-04	8.31E-05	NC	NC	NC	NC	NC	NC
Total Potential Hazard Index	1.15E-02	6.04E-03	NC	NC	NC	NC	NC	NC
<b><u>Recreational Fisher</u></b>								
Surface Water (ing/derm)	NC	NC	1.51E-02	1.96E-03	1.51E-02	1.96E-03	1.51E-02	1.96E-03
Sediment (ing/derm)	NC	NC	3.62E-04	2.49E-05	3.62E-04	2.49E-05	3.62E-04	2.49E-05
Fish Fillet, Buffalo Fillet (ing)	NC	NC	2.24E-02	2.80E-03	NC	NC	NC	NC
Total Potential Hazard Index	NC	NC	3.79E-02	4.79E-03	1.55E-02	1.99E-03	1.55E-02	1.99E-03
Notes DDA - Downstream Discharge Area (Mississippi River) derm - dermal contact ing - ingestion inh - inhalation MLE - Maximum Likely Exposure NC - Not Calculated. No constituents of potential concern were identified for this pathway. PDA - Plume Discharge Area (Mississippi River) RME - Reasonable Maximum Exposure UDA - Upstream Discharge Area (Mississippi River)								

TABLE 6-25  
SUMMARY OF CONSITUENTS OF CONCERN (COCs)  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Site	Receptor	Scenario	COC	Cancer (a) Potential Risk	Non-Cancer (a)		Medium	Pathway	EPC	Units
					HQ	Endpoint				
O	Outdoor Industrial Worker	RME	Xylenes	ND	3 23	Neurological	Combined soil	Inhalation	14000	mg/kg
O	Construction/Utility Worker	RME	Chlorobenzene	ND	1	Liver	Combined soil	Inhalation	760	mg/kg
O	Construction/Utility Worker	RME	Xylenes	ND	14 2	Neurological	Combined soil	Inhalation	14000	mg/kg
O	Construction/Utility Worker	RME	Benzene	NCOC	3 16	Immune	Combined soil	Inhalation	500	mg/kg
O	Construction/Utility Worker	RME	PCBs	NCOC	2 53	Immune, skin, eye	Combined soil	Ingestion/Dermal	298	mg/kg
O North	Outdoor Industrial Worker	RME	PCBs	1 66E-04	11 6	Immune, skin, eye	Surface soil	Ingestion/Dermal	709	mg/kg
O North	Outdoor Industrial Worker	RME	2,3,7,8-TCDD TEQ	4 59E-04	ND	ND	Surface soil	Ingestion/Dermal	0 0508	mg/kg
O North	Outdoor Industrial Worker	RME	Xylenes	ND	1 23	Neurological	Combined soil	Inhalation	3900	mg/kg
O North	Outdoor Industrial Worker	MLE	PCBs	NCOC	7 27	Immune, skin, eye	Surface soil	Ingestion/Dermal	709	mg/kg
O North	Outdoor Industrial Worker	MLE	2,3,7,8-TCDD TEQ	8 32E-05	ND	ND	Surface soil	Ingestion/Dermal	0 0508	mg/kg
O North	Construction/Utility Worker	RME	2,3,7,8-TCDD TEQ	1 15E-04	ND	ND	Combined soil	Ingestion/Dermal	0 0508	mg/kg
O North	Construction/Utility Worker	RME	Xylenes	ND	3 95	Neurological	Combined soil	Inhalation	3900	mg/kg
O North	Construction/Utility Worker	RME	PCBs	NCOC	25 7	Immune, skin, eye	Combined soil	Ingestion/Dermal	3030	mg/kg
O North	Construction/Utility Worker	RME	PCBs	NCOC	2 81	Immune, skin, eye	Leachate	Ingestion/Dermal	0 055	mg/L
O North	Construction/Utility Worker	MLE	PCBs	NCOC	5 48	Immune, skin, eye	Combined soil	Ingestion/Dermal	1780	mg/kg
O North	Construction/Utility Worker	MLE	PCBs	NCOC	1 4	Immune, skin, eye	Leachate	Ingestion/Dermal	0 055	mg/L
O North	Trespassing Teenager	RME	PCBs	NCOC	4 86	Immune, skin, eye	Surface soil	Ingestion/Dermal	709	mg/kg
O North	Trespassing Teenager	RME	2,3,7,8-TCDD TEQ	8 62E-05	ND	ND	Surface soil	Ingestion/Dermal	0 0508	mg/kg
O North	Trespassing Teenager	MLE	PCBs	NCOC	1 33	Immune, skin, eye	Surface soil	Ingestion/Dermal	709	mg/kg
Q North	Construction/Utility Worker	RME	2,4,6-Trichlorophenol	NCOC	8 43	Reproductive	Leachate	Ingestion/Dermal	12 5	mg/L
Q North	Construction/Utility Worker	RME	2,4-Dichlorophenol	ND	1 82	Immune	Leachate	Ingestion/Dermal	170	mg/L
Q North	Construction/Utility Worker	MLE	2,4,6-Trichlorophenol	NCOC	4 21	Reproductive	Leachate	Ingestion/Dermal	12 5	mg/L
Q North	Construction/Utility Worker	MLE	2,4-Dichlorophenol	ND	0 907	Immune	Leachate	Ingestion/Dermal	170	mg/L
Q Pond	Recreational Fisher	RME	PCBs	3,79E-04	22 1	Immune, skin, eye	Black bullhead fillet	Ingestion	3 87	mg/kg
Q Pond	Recreational Fisher	RME	Dieldrin	7 84E-05	NCOC	NCOC	Black bullhead fillet	Ingestion	0 1	mg/kg
Q Pond	Recreational Fisher	MLE	PCBs	NCOC	2 76	Immune, skin, eye	Black bullhead fillet	Ingestion	3 87	mg/kg
Q Pond	Recreational Fisher	RME	PCBs	9 80E-04	57 1	Immune, skin, eye	Carp fillet	Ingestion	10	mg/kg
Q Pond	Recreational Fisher	RME	Dieldrin	1 49E-04	NCOC	NCOC	Carp fillet	Ingestion	0 19	mg/kg
Q Pond	Recreational Fisher	RME	2,3,7,8-TCDD TEQ	1 35E-04	ND	ND	Carp fillet	Ingestion	1 84E-05	mg/kg
Q Pond	Recreational Fisher	RME	Benzo(a)pyrene	6 44E-05	ND	ND	Carp fillet	Ingestion	0 18	mg/kg
Q Pond	Recreational Fisher	RME	Arsenic	6 02E-05	NCOC	NCOC	Carp fillet	Ingestion	0 82	mg/kg
Q Pond	Recreational Fisher	MLE	PCBs	NCOC	7 14	Immune, skin, eye	Carp fillet	Ingestion	10	mg/kg
R	Outdoor Industrial Worker	RME	Trichloroethylene	6 12E-04	NCOC	NCOC	Combined soil	Inhalation	2200	mg/kg
R	Outdoor Industrial Worker	RME	Trichloroethylene	6 93E-04	NCOC	NCOC	Leachate	Inhalation	150	mg/L
R	Outdoor Industrial Worker	MLE	Trichloroethylene	1 34E-04	NCOC	NCOC	Leachate	Inhalation	150	mg/L
R	Construction/Utility Worker	RME	Trichloroethylene	4 33E-05	1 22	Liver	Combined soil	Ingestion/Dermal	2200	mg/kg
R	Construction/Utility Worker	RME	Trichloroethylene	7 13E-04	14 43	Liver, Neurological	Leachate	Ingestion/Dermal/Inhalation	150	mg/L
R	Construction/Utility Worker	RME	PCBs	1 17E-04	204	Immune, skin, eye	Leachate	Ingestion/Dermal	3 98	mg/L
R	Construction/Utility Worker	RME	1,2-Dichloroethane	5 54E-05	8 42	Liver, kidney, GI, and skin	Leachate	Inhalation	50	mg/L
R	Construction/Utility Worker	RME	Mercury	ND	0 747	Immune	Combined soil	Ingestion/Dermal	699	mg/kg
R	Construction/Utility Worker	MLE	Trichloroethylene	2 19E-04	5 76	Liver	Leachate	Inhalation	150	mg/L
R	Construction/Utility Worker	MLE	PCBs	NCOC	102	Immune, skin, eye	Leachate	Ingestion/Dermal	3 98	mg/L
R	Construction/Utility Worker	MLE	1,2-Dichloroethane	NCOC	2 53	Liver, kidney, GI, and skin	Leachate	Inhalation	50	mg/L

TABLE 6-25  
SUMMARY OF CONSTITUENTS OF CONCERN (COCs)  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Site	Receptor	Scenario	COC	Cancer (a) Potential Risk	Non-Cancer (a)		Medium	Pathway	EPC	Units
					HQ	Endpoint				
S	Outdoor Industrial Worker	RME	PCBs	2.37E-04	16.6	Immune, skin, eye	Surface soil	Ingestion/Dermal	1010	mg/kg
S	Outdoor Industrial Worker	MLE	PCBs	NCOC	5.17	Immune, skin, eye	Surface soil	Ingestion/Dermal	504	mg/kg
S	Construction/Utility Worker	RME	PCBs	NCOC	8.56	Immune, skin, eye	Combined soil	Ingestion/Dermal	1010	mg/kg
S	Trespassing Teenager	RME	PCBs	NCOC	6.91	Immune, skin, eye	Surface soil	Ingestion/Dermal	1010	mg/kg

Notes:

EPC - Exposure point concentration.

GI - Gastrointestinal.

HQ - Hazard Quotient.

MLE - Most Likely Exposure.

NCOC - Not a constituent of concern via this pathway.

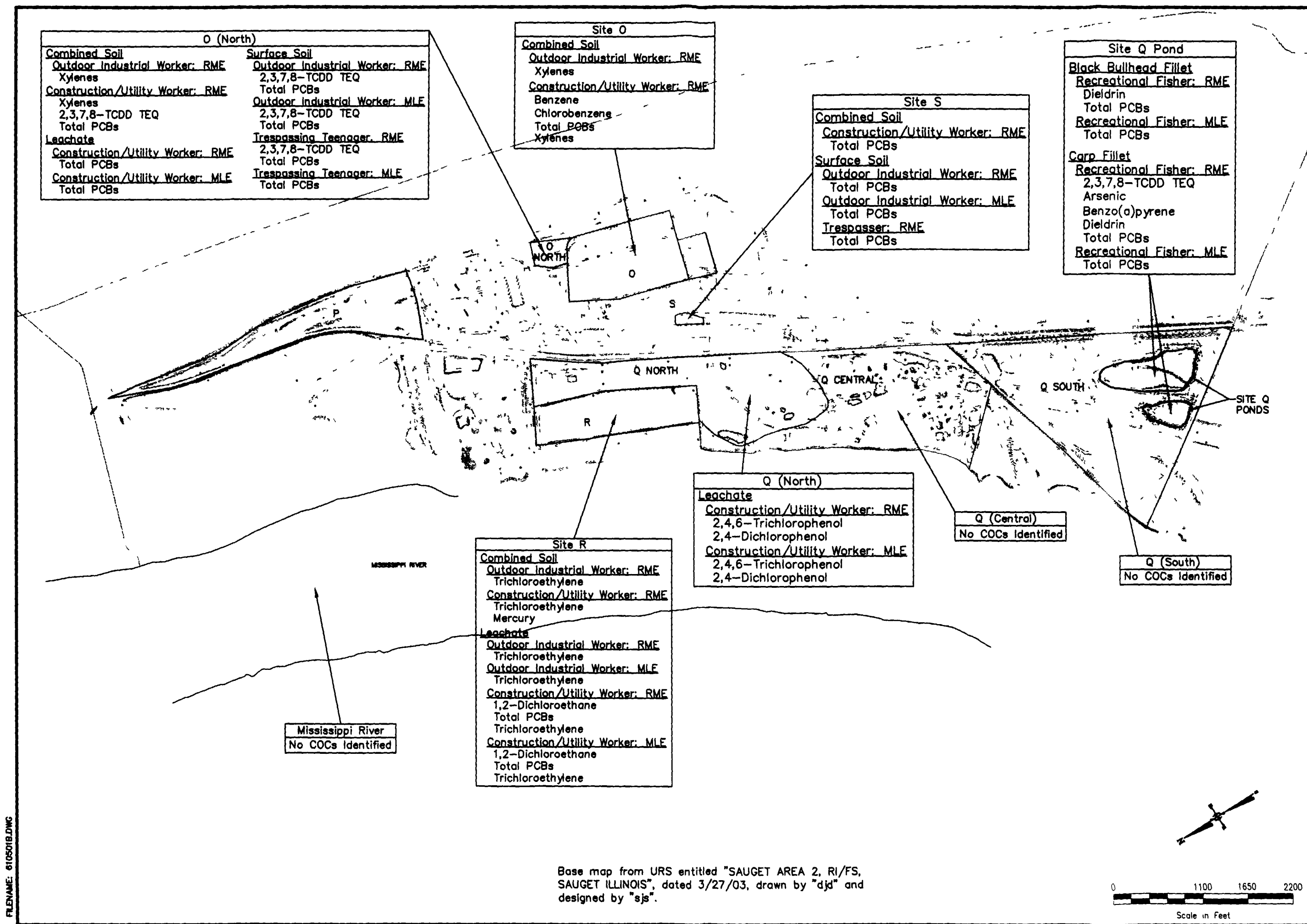
ND - No Dose-Response value for this pathway.

PCBs - Polychlorinated Biphenyls

RME - Reasonable Maximum Exposure.

TCDD-TEQ - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration.

(a) - Only constituents driving a risk exceedance are presented on this table.

[illegible]

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CONSTITUENTS OF CONCERN (COCs)		DATE	PROJECT NUMBER:
HUMAN HEALTH RISK ASSESSMENT		7/01	0610E 000
SAUGET AREA 2 RI/FS			
SAUGET, IL			
SCALE:			
4" = 400'			

FIGURE NUMBER:  
**6-1**  
SHEET NUMBER:  
X



## 7.0 SUMMARY AND CONCLUSIONS

This report presents the baseline HHRA for Sauget Area 2, located in Sauget and Cahokia, Illinois. On November 20, 2000, the SA2SG PRPs signed an AOC, Docket Number V-W-01-C-622, to perform a RI/FS at Sauget Area 2 Sites O, P, Q, R, and S. USEPA signed the AOC on November 24, 2000. This HHRA is submitted to partially fulfill the requirements of Section V.2. of the AOC, and of Section 2.6 of Task 3 of the Scope of Work presented as Attachment B of the AOC. The HHRA was conducted to satisfy the AOC, as well as to be compliant with the NCP (USEPA, 1990).

The HHRA was conducted in accordance with the U.S. Environmental Protection Agency (USEPA)-approved Human Health Risk Assessment Workplan (HHRA Workplan) dated May 25, 2001 (including September 2001 and May 2002 revised pages), which was submitted as Section 11 of Volume 1 of the Support Sampling Plan (SSP) for Sauget Area 2 (URS, 2001). The HHRA Workplan is provided as Appendix A to this report.

The HHRA was conducted using data from environmental samples collected from the study area (shown in Figure 1-1 and described in more detail in Section 2) in accordance with the USEPA-approved SSP. The SSP for Sauget Area 2 was designed to investigate two major areas of the Sauget Area 2 study area (the media sampled in each are identified in parentheses):

- The Sites O, P, Q, R, and S (waste, soil, groundwater, leachate, ambient air – all sites; sediment, surface water, fish tissue – Site Q Pond only); and
- Mississippi River adjacent to the Sites (sediment, surface water and fish tissue).

Background or reference samples were collected for surface soil, subsurface soil, groundwater, surface water, sediment, fish tissue, and ambient air. The SSP identified the suites of analytes for each medium. The analytes included in the risk assessment are: VOCs, SVOCs, metals, mercury, cyanide, PCBs, pesticides, herbicides, and dioxins and furans. Validated laboratory analytical data are compiled in the Data Validation Report (URS, 2003a), and field data are compiled in the Field Sampling Report (URS, 2003b).

The baseline HHRA has been conducted in accordance with the four-step paradigm for human health risk assessments developed by USEPA (USEPA, 1989a); these steps are:

- Data Evaluation and Hazard Identification
- Toxicity Assessment
- Exposure Assessment
- Risk Characterization

The risk assessment results are summarized by step below.

## **7.1 Data Evaluation and Hazard Identification**

The purpose of the data evaluation and hazard identification process is two-fold: 1) to evaluate the nature and extent of release of constituents present at the site; and 2) to select a subset of these constituents identified as COPCs for quantitative evaluation in the risk assessment. This step of the risk assessment involves compiling and summarizing the data for the risk assessment, and selecting COPCs based on a series of screening steps. Several factors are typically considered in selecting COPCs for a site, including natural background, frequency of detection, and toxicity, including essential nutrient status.

Per the HHRA Workplan, USEPA Region 9 PRGs (2002b) for industrial soils were used for the identification of COPCs for soil and sediment for quantitative evaluation in the risk assessment. The Illinois TACO program also provides screening criteria for the groundwater ingestion component of the soil to groundwater pathway that were used here. These latter values conservatively address leaching of constituents from soils to underlying groundwater.

COPCs in groundwater and surface water were identified using IEPA Class I standards (35 Ill. Adm. Code 620.410) (IEPA, 2002a). For the Class I groundwater comparison, where Class I standards were not available, federal MCLs (USEPA, 2002c) were used; where MCLs were not available, the IEPA remediation objectives for Class I groundwater were used (IEPA, 2002b); where these were not available, the most current USEPA PRGs (USEPA, 2002b) for tap water were used.

Fish tissue data were compared to the USEPA Region 3 RBCs for fish (USEPA, 2003a). Ambient air concentrations were compared to USEPA Region 9 PRGs (USEPA, 2002b) for ambient air.

Background samples were collected in the vicinity of the site to provide information on levels of constituents typical for the local area. The purpose of comparing site conditions to local background or reference locations is to determine if site concentrations of constituents are representative of background concentrations, which, therefore, should not be included in risk calculations. Background comparisons were conducted for each medium using site-specific background or reference data.

The procedure for determining whether a constituent concentration is consistent with background follows that developed by USEPA Region 4 (USEPA, 2000a) and presented in the HHRA Workplan (Appendix A). Maximum detected concentrations of constituents in environmental media at the site were compared to two times the arithmetic mean site-specific background concentration. Therefore, if maximum concentrations of constituents in an area are found to be less than two times the average background concentrations, then those constituents are eliminated from quantitative evaluation in the risk assessment.

In the screening process, constituents in an area/medium with maximum concentrations less than or equal to the screening criteria were not included as COPCs. Where no COPCs are identified for an area/medium, that area/medium was not evaluated quantitatively in the HHRA.

COPCs in surface soil are identified in Table 3-1. COPCs were identified in Site O, Site O (North), Site P, Site Q (North), Site Q (Central), Site Q (South), and Site S. No COPCs were identified in Site R surface soils. Figure 3-7 presents the locations of the COPCs in surface soil.

COPCs in combined soil are identified in Table 3-2. COPCs in combined soils were identified in all sites for the construction worker direct-contact pathway. COPCs in combined soils for the ambient air pathway (non-excavation scenarios) were identified in all Sites with the exception of Site Q (Central). Figure 3-8 presents the locations of the COPCs in combined soils.

The selection of COPCs for groundwater was conducted on a location-by-location basis. Samples with screening intervals or sample collection depths between 0 and 30 feet bgs were included in the evaluation. Because groundwater in the area is not used a source of drinking water (see Appendix P), exposure to COPCs in groundwater could occur due to either volatilization of COPCs into indoor or outdoor air, or contact with COPCs in groundwater exposed in an excavation trench. Per the HHRA Workplan, a 15-foot bgs excavation depth is assumed. Moreover, volatilization from groundwater through the soil column to indoor and/or outdoor air is generally assumed to occur at depths of up to 30 feet bgs. Based on these considerations, a total of 13 groundwater sampling locations were included in the evaluation.

The results of the COPC selection for groundwater are presented in Table 3-3 (shallow groundwater and leachate) and Table 3-4 (volatiles only, shallow/mid groundwater and leachate). Of the 13 groundwater sampling locations and three leachate wells evaluated, COPCs were identified in only three groundwater locations and in all three leachate wells. For the shallow groundwater and leachate evaluation (construction worker contact and inhalation in an excavation trench) only one groundwater location (AA-O-1) had COPCs identified. All three leachate wells had COPCs identified. For the shallow/ mid groundwater and leachate evaluation (volatilization pathways only), only two groundwater locations (AA-Q-6 and AA-R-1) had volatile COPCs identified. All three leachate wells had volatile COPCs identified. Lead was identified as a COPC in shallow groundwater at location AA-O-1 and in all three leachate locations.

Arsenic was identified as the only COPC in Mississippi River sediment, as shown in Table 3-5. No COPCs were identified in Site Q Pond sediment.

Lead and manganese were identified as COPCs in the Site Q Pond surface water (Table 3-6). COPCs in the Mississippi River surface water included 2,4-dichlorophenol, 4-chloroaniline, 2-methyl-4-chlorophenoxyacetic acid, and 2-(2-methyl-4-chlorophenoxy)propionic acid.

Table 3-7 indicates that Dioxin TEQ was identified as a COPC in buffalo fish fillet at the PDA, UDA, and DDA areas of the Mississippi River. Additionally, 4,4-DDE and dieldrin were identified in buffalo fish fillet at the UDA area. COPCs in black bullhead fish fillet in the Site Q Pond included Dioxin TEQ, 4,4-DDT, alpha-chlordane, arsenic, dieldrin, mercury, and PCBs. COPCs in carp fillet in the Site Q Pond included all of those listed for black bullhead fillet as well as benzo(a)anthracene, benzo(a)pyrene, beta-BHC, bis(2-ethylhexyl)phthalate, and dibenzo(a,h)anthracene.

## **7.2 Dose-Response Assessment**

The purpose of the dose-response assessment is to identify the types of adverse health effects a constituent may potentially cause, and to define the relationship between the dose of a constituent and the likelihood or magnitude of an adverse effect (response) (USEPA, 1989a). Adverse effects are classified by USEPA as potentially carcinogenic or noncarcinogenic (i.e., potential effects other than cancer). Dose-response relationships are defined by USEPA for oral exposure and for exposure by inhalation. Oral toxicity values are also used to assess dermal exposures, with appropriate adjustments, because USEPA has not yet developed values for this route of exposure. Combining the results of the toxicity assessment with information on the magnitude of potential human exposure provides an estimate of potential risk.

Sources of the published toxicity values in this risk assessment include USEPA's IRIS database (USEPA, 2003a), HEAST (USEPA, 1997b), and the USEPA NCEA in Cincinnati, Ohio.

Risks were calculated for 2,3,7,8-TCDD and the dioxin and furan congeners using the cancer slope factor for 2,3,7,8-TCDD listed in HEAST and using the TEFs provided by WHO (Van den Berg et al., 1998), presented in Table 4-6. The TEFs are fractions that equate the potential toxicity of specific congeners to that of 2,3,7,8-TCDD.

## **7.3 Exposure Assessment**

The purpose of the exposure assessment is to predict the magnitude and frequency of potential human exposure to each of the COPCs retained for quantitative evaluation in the HHRA. The first step in the exposure assessment process is the characterization of the setting of the site and surrounding area. Current and potential future site uses and potential receptors (i.e., people who may contact the impacted environmental media of interest) are then identified. Potential exposure scenarios identifying appropriate environmental media and exposure pathways for current and potential future site uses and receptors are then developed. Those potential exposure pathways for which COPCs are identified and are judged to be complete are evaluated quantitatively in the risk assessment. Both RME and MLE exposure scenarios are evaluated for each receptor in the HHRA.

### 7.3.1 Conceptual Site Model

To guide identification of appropriate exposure pathways and receptors for evaluation in the risk assessment, a CSM for human health was developed. The purpose of the CSM is to identify source areas, potential migration pathways of constituents from source areas to environmental media where exposure can occur, and to identify potential human receptors.

The CSM for the Sauget Area 2 HHRA is presented in Figure 5-1. The CSM identifies potential sources, constituent migration pathways from one medium to another, and potential exposure pathways (e.g., soil, groundwater), potential exposure routes (e.g., ingestion, inhalation), and potential receptors (e.g., worker, trespasser).

### 7.3.2 Exposure Point Concentrations

Exposure points are located where potential receptors may contact COPCs at or from the site. The concentration of COPCs in the environmental medium that receptors may contact must be estimated in order to determine the magnitude of potential exposure. Both measured and modeled EPCs have been used in this risk assessment.

Measured EPCs. The EPC for an HHRA is defined as the 95% UCL on the arithmetic mean concentration, or the maximum concentration, whichever is lower (USEPA, 2002a), for the RME scenario and the arithmetic mean concentration for the MLE scenario. Summary statistics have been calculated for each COPC in each medium, as presented in Appendix B. Calculation of the 95% UCL is dependent upon the distribution of the data set. The 95% UCL calculations were conducted as described by USEPA (2002a) in Appendix I.

Modeled EPCs. Some pathways required modeling to derive the EPCs. These pathways include volatile constituents in groundwater migrating upwards and infiltrating into indoor air, outdoor air and excavation air, volatile constituents in soil migrating upwards and infiltrating into outdoor air and excavation air, and generation of fugitive dusts from undisturbed soils as well as during construction activities. The models used are described in Section 5.0 and the appendices.

The exposure point concentrations for each COPC in each medium are presented in tables in Section 5 for both the RME and MLE scenarios.

### 7.3.3 Receptor Evaluation

Table 5-1 presents the detailed receptor/pathway/area matrix that summarizes the receptors evaluated in each area, by medium and exposure route. These scenarios were developed based on the data, the CSM, and the COPCs identified in each medium. RME scenarios and MLE scenarios based on appropriate USEPA guidance were both evaluated in the quantitative risk assessment.

To estimate the potential risk to human health that may be posed by the presence of COPCs in environmental media in the study area, it is first necessary to estimate the potential exposure dose of each COPC for each receptor. The exposure dose is estimated for each constituent via each exposure pathway by which the receptor is assumed to be exposed. Exposure dose equations combine the estimates of constituent concentration in the environmental medium of interest with assumptions regarding the type and magnitude of each receptor's potential exposure to provide a numerical estimate of the exposure dose. The exposure dose is defined as the amount of COPC taken into the receptor and is expressed in units of milligrams of COPC per kilogram of body weight per day (mg/kg-day). The exposure doses are combined with the toxicity values to estimate potential risks and hazards for each receptor. The exposure dose and risk calculation spreadsheets are presented in Appendix M.

#### **7.4 Risk Characterization Methodology**

The potential risk to human health associated with potential exposure to COPCs in environmental media at the site is evaluated in this step of the risk assessment process. Risk characterization is the process in which the dose-response information (Section 4.0) is integrated with quantitative estimates of human exposure derived in the Exposure Assessment (Section 5.0). The result is a quantitative estimate of the likelihood that humans will experience any adverse health effects given the exposure assumptions made. Two general types of health risk are characterized for each potential exposure pathway considered: potential carcinogenic risk and potential noncarcinogenic hazard. Carcinogenic risk is evaluated by averaging exposure over a normal human lifetime, which, based on USEPA guidance (1989a), is assumed to be 70 years. Noncarcinogenic hazard is evaluated by averaging exposure over the total exposure period.

Characterization of the potential impact of potential carcinogenic and noncarcinogenic constituents is approached in very different ways. The difference in approaches arises from the conservative assumption that substances with possible carcinogenic action proceed by a no-threshold mechanism, whereas other toxic actions may have a threshold, a dose below which few individuals would be expected to respond. Thus, under the no-threshold assumption, it is necessary to calculate a risk, but for constituents with a threshold, it is possible to simply characterize an exposure as above or below the threshold. In risk assessment, that threshold is termed an RfD.

##### **7.4.1 Carcinogenic Risk Characterization**

The purpose of carcinogenic risk characterization is to estimate the upper-bound likelihood, over and above the background cancer rate, that a receptor will develop cancer in his or her lifetime as a result of exposure to a constituent in environmental media at the site. This likelihood is a function of the dose of a constituent (described in the Exposure Assessment, Section 5.0) and the CSF (described in the Toxicity Assessment, Section 4.0) for that constituent. The ELCR is the likelihood over and above the background cancer rate, which currently in the US is approximately 1 in 3 (Jemal et al., 2002), that an

individual will contract cancer in his or her lifetime. The risk value is expressed as a probability (e.g.,  $10^{-6}$ , or one in one million). The ELCR is calculated using the following equation:

$$\text{ELCR} = \text{LADD (mg/kg-day)} \times \text{CSF (mg/kg-day)}^{-1}$$

The potential carcinogenic risk for each exposure pathway is calculated for each receptor. In current regulatory risk assessment, it is assumed that cancer risks are additive or cumulative. Pathway and area-specific risks were summed to estimate the total site potential cancer risk for each receptor. A summary of the total site cancer risks for each receptor group were presented in Section 6.0 and compared to the USEPA's target risk range of  $10^{-4}$  to  $10^{-6}$ .

Any COPC that causes an exceedance of the  $10^{-4}$  risk level for a particular receptor is designated a COC. Both RME and MLE results are considered in the identification of COCs. COCs are identified in Section 7.5

The target risk levels used for the identification of COCs are based on USEPA guidance and Illinois TACO guidance. Specifically, USEPA provides the following guidance (USEPA, 1991a):

"Where the cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than  $10^{-4}$ , and the non-carcinogenic hazard quotient is less than 1, action generally is not warranted unless there are adverse environmental impacts." and,

"The upper boundary of the risk range is not a discrete line at  $1 \times 10^{-4}$ , although EPA generally uses  $1 \times 10^{-4}$  in making risk management decisions. A specific risk estimate around  $10^{-4}$  may be considered acceptable if justified based on site-specific conditions."

IEPA provides the following summary for the evaluation of cumulative risk for carcinogens (IEPA, 2002b, Fact Sheet 13: Mixture Rule):

"The cumulative risk of carcinogenic contaminants attacking the same target must not exceed 1 in 10,000 [ $10^{-4}$ ]. Therefore, the risk from all on-site similar acting carcinogens must be added together. If this cumulative risk level is greater than 1 in 10,000, corrective action must be taken to reach an acceptable risk level."

#### **7.4.2 Non-Carcinogenic Risk Characterization**

The potential for exposure to a constituent to result in adverse noncarcinogenic health effects is estimated for each receptor by comparing the Chronic Average Daily Dose (CADD) for each COPC

with the RfD for that COPC. The resulting ratio, which is unitless, is known as the HQ for that constituent. The HQ is calculated using the following equation:

$$HQ = \frac{CADD (mg/kg - day)}{RfD (mg/kg - day)}$$

The target HQ is defined as an HQ of less than or equal to one (USEPA, 1989a). When the HQ is less than or equal to 1, the RfD has not been exceeded, and no adverse noncarcinogenic effects are expected. If the HQ is greater than 1, there may be a potential for adverse noncarcinogenic health effects to occur; however, the magnitude of the HQ cannot be directly equated to a probability or effect level. HQs for a given pathway are summed to provide an HI. Pathway HIs are summed to provide a total receptor HI. When the HI is less than 1, the target has not been exceeded, and no adverse noncarcinogenic effects are expected. This initial HI summation assumes that all the COPCs are additive in their toxicity, and is considered only a screening step as additive toxicity may not be correct. If the HI is greater than 1, further evaluation is necessary to determine if the COPCs are additive in toxicity. This evaluation is termed a toxic endpoint analysis, and is discussed in Appendix N. Any COPC that causes an exceedance of a toxic-endpoint specific HI of 1 was designated a COC.

## 7.5 Risk Assessment Results

Exceedances of USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and target HI of 1 are identified by site and receptor in the following sections. Where HI exceedances are identified, a target endpoint analysis was conducted, as presented in Appendix N. COPCs that significantly contribute to an exceedance of the  $10^{-4}$  risk level are identified as COCs. COPCs that significantly contribute to an exceedance of the target endpoint HI of 1 are also identified as COCs. Where COCs are identified, information regarding current site use is discussed for the receptors of interest.

### 7.5.1 Site O

As shown on Table 7-1, all potential risks calculated for both the RME and MLE receptor scenarios for Site O are within or below the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$ .

As shown on Table 7-3, there are exceedances of the target HI of 1 for several receptor scenarios. The target endpoint analyses are presented in Appendix N. A summary is provided below. For each receptor, the total HI and COCs are identified (target endpoint, HQ, medium, pathway and EPC are identified for each COC):

- Outdoor Industrial Worker: RME (HI = 4.18)
  - COC: Xylenes (neurological effects, HQ = 3.23, combined soil, inhalation of VOCs, EPC = 14,000 mg/kg)

- Construction/Utility Worker: RME (HI = 21.4)
  - COC: Chlorobenzene (liver effects, HQ = 1.0, combined soil, inhalation of VOCs, EPC = 760 mg/kg)
  - COC: Xylenes (neurological effects, HQ = 14.2, combined soil, inhalation of VOCs, EPC = 14,000 mg/kg)
  - COC: Benzene (immune effects, HQ = 3.16, combined soil, inhalation of VOCs, EPC = 500 mg/kg)
  - COC: PCBs (immune, skin and eye effects, HQ = 2.53, combined soil, ingestion and dermal contact, EPC = 298 mg/kg)
- Construction/Utility Worker: MLE (1.27)
  - COCs: none identified based on target endpoint analysis.

Site O is located in an isolated area and is not currently used. As discussed in Section 2.3.1, the former ABRTF lagoons are covered and vegetated, and the vegetation is mowed periodically during the warmer months of the year. Therefore, the potential risks presented above for workers represent the future scenario (the only activity under the current scenario is mowing, which is limited in frequency and duration). The receptor assumptions are extremely conservative for this area, as it is unlikely that an outdoor industrial worker would access the site for 190 days per year. It is also unlikely that construction/utility work would occur in this area for the assumed 40 day period (RME) or 20 day period (MLE).

### 7.5.2 Site O (North)

As shown in Tables 7-1 and 7-3, there are exceedances of the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and target hazard index of 1 for several Site O (North) receptor scenarios. The target endpoint analyses are presented in Appendix N. A summary is provided below. For each receptor the total risk or total HI is presented. COCs are identified for both potential carcinogenic and noncarcinogenic effects. For COCs identified based on potential carcinogenic effects, the risk level, medium, pathway and EPC are identified. For potential noncarcinogenic effects, the target endpoint, HQ, medium, pathway and EPC are identified for each COC.

- Outdoor Industrial Worker: RME (Risk = 6.28E-04)
  - COC: Total PCBs (Risk = 1.66E-04, surface soil, ingestion and dermal contact, EPC = 709 mg/kg)
  - COC: Dioxin TEQ (Risk = 4.59E-04, surface soil, ingestion and dermal contact, EPC = 0.0508 mg/kg)
- Outdoor Industrial Worker: RME (HI = 13.3)

- COC: Xylenes (neurological effects, HQ = 1.23, combined soil, inhalation of VOCs, EPC = 3900 mg/kg)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 11.6, surface soil, ingestion and dermal contact, EPC = 709 mg/kg)
- Outdoor Industrial Worker: MLE (Risk = 1.13E-04)
  - COC: Dioxin TEQ (Risk = 8.32E-05, surface soil, ingestion and dermal contact, EPC = 0.0508 mg/kg)
- Outdoor Industrial Worker: MLE (HI = 8)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 7.27, surface soil, ingestion and dermal contact, EPC = 709 mg/kg)
- Construction/Utility Worker: RME (Risk = 1.36E-04)
  - COC: Dioxin TEQ (Risk = 1.15E-04, combined soil, ingestion and dermal contact, EPC = 0.0508 mg/kg)
- Construction/Utility Worker: RME (HI = 34.8)
  - COC: Xylenes (neurological effects, HQ = 3.95, combined soil, inhalation of VOCs, EPC = 3900 mg/kg)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 28.5, combined soil and leachate, ingestion and dermal contact, EPC (combined soil) = 3030 mg/kg), EPC (leachate) = 0.055 mg/L)
- Construction/Utility Worker: MLE (HI = 8.2)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 6.89, combined soil and leachate, ingestion and dermal contact, EPC (combined soil) = 1780 mg/kg), EPC (leachate) = 0.055 mg/L)
- Trespassing Teenager: RME (Risk = 1.17E-04)
  - COC: Dioxin TEQ (Risk = 8.62E-05, surface soil, ingestion and dermal contact, EPC = 0.0508 mg/kg)
- Trespassing Teenager: RME (HI = 4.97)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 4.86, surface soil, ingestion and dermal contact, EPC = 709 mg/kg)
- Trespassing Teenager: MLE (HI = 1.34)

- COC: Total PCBs (immune, skin and eye effects, HQ = 1.33, surface soil, ingestion and dermal contact, EPC = 709 mg/kg)

Site O (North) is located in an isolated area and is not currently used. As discussed in Section 2.3.1, the former ABRTF lagoons are covered and vegetated, and the vegetation is mowed periodically during the warmer months of the year. Therefore, the potential risks presented above for workers represent the future scenario (the only activity under the current scenario is mowing, which is limited in frequency and duration).. The receptor assumptions are extremely conservative for this area, as it is unlikely that an outdoor industrial worker would access the site for 190 days per year. It is also unlikely that construction/utility work would occur in this area for the assumed 40 day period (RME) or 20 day period (MLE). Due to the isolated nature of the site, it is unlikely that trespassers would enter the site as frequently as assumed (26 days RME, 13 days MLE).

#### **7.5.3 Site P**

As shown on Tables 7-1 and 7-3, all potential risks and HIs calculated for both the RME and MLE receptor scenarios for Site P are within or below the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and below the target HI of 1.

#### **7.5.4 Site Q (North)**

As shown on Table 7-1, all potential risks calculated for both the RME and MLE receptor scenarios for Site Q (North) are within or below the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$ .

As shown in Table 7-3, there are exceedances of the USEPA's target hazard index of 1 for two Site Q (North) receptor scenarios. The target endpoint analyses are presented in Appendix N. A summary is provided below. For each receptor the total HI is presented. COCs are identified for potential noncarcinogenic effects. For each COC, the target endpoint, HQ, medium, pathway and EPC are identified.

- Construction/Utility Worker: RME (HI = 11.7)
  - COC: 2,4,6-Trichlorophenol (reproductive effects, HQ = 8.43, leachate, ingestion and dermal contact, EPC = 12.5 mg/L)
  - COC: 2,4-Dichlorophenol (immune effects, HQ = 1.82, leachate, ingestion and dermal contact, EPC = 170 mg/L)
- Construction/Utility Worker: MLE (HI = 5.55)
  - COC: 2,4,6-Trichlorophenol (reproductive effects, HQ = 4.21, leachate, ingestion and dermal contact, EPC = 12.5 mg/L)

- COC: 2,4-Dichlorophenol (immune effects, HQ = 0.907, leachate, ingestion and dermal contact, EPC = 170 mg/L)

A 10-acre site on Site Q (North) is currently used by Rivercity Landscape Supply as a bulk storage terminal for lawn and garden products. Raw landscape products such as mulch, rock and soil are processed and packed on this portion of the site. Access to some portions of the site is restricted by fencing and gates. Other parts of the site have unrestricted access. As noted above, potential risk exceedances for this area were identified for the construction/utility worker, not for the outdoor industrial worker. Therefore, these are potential risks for a future construction/utility worker, as there is no current excavation work in this area.

#### **7.5.5 Site Q (Central)**

As shown on Tables 7-1 and 7-3, all potential risks and HIs calculated for both the RME and MLE receptor scenarios for Site Q (Central) are within or below the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and below the target HI of 1.

#### **7.5.6 Site Q (South)**

As shown on Tables 7-1 and 7-3, all potential risks and HIs calculated for both the RME and MLE receptor scenarios for Site Q (South) are within or below the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and below the target HI of 1.

#### **7.5.7 Site Q Pond**

As shown in Tables 7-1 and 7-3, there are exceedances of the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and target hazard index of 1 for several Site Q Pond receptor scenarios, due to the assumed ingestion of fish scenario. The target endpoint analyses are presented in Appendix N. A summary is provided below. For each receptor the total risk or total HI is presented. COCs are identified for both potential carcinogenic and noncarcinogenic effects. For COCs identified based on potential carcinogenic effects, the risk level, medium, pathway and EPC are identified. For potential noncarcinogenic effects, the target endpoint, HQ, medium, pathway and EPC are identified for each COC.

- Recreational Fisher - black bullhead fillet: RME (Risk = 5.49E-04)
  - COC: Total PCBs (Risk = 3.79E-04, black bullhead fillet, ingestion, EPC = 3.87 mg/kg)
  - COC: Dieldrin (Risk = 7.84E-05, black bullhead fillet, ingestion, EPC = 0.1 mg/kg)
- Recreational Fisher - black bullhead fillet: RME (HI = 22.9)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 22.1, black bullhead fillet, ingestion, EPC = 3.87 mg/kg)

- Recreational Fisher - black bullhead fillet: MLE (HI = 2.86)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 2.76, black bullhead fillet, ingestion, EPC = 3.87 mg/kg)
- Recreational Fisher - carp fillet: RME (Risk = 1.45E-03)
  - COC: Total PCBs (Risk = 9.8E-04, carp fillet, ingestion, EPC = 10 mg/kg)
  - COC: Dieldrin (Risk = 1.49E-04, carp fillet, ingestion, EPC = 0.19 mg/kg)
  - COC: Dioxin TEQ (Risk = 1.35E-04, carp fillet, ingestion, EPC = 1.84E-05 mg/kg)
  - COC: Benzo(a)pyrene (Risk = 6.44E-05, carp fillet, ingestion, EPC = 0.18 mg/kg)
  - COC: Arsenic (Risk = 6.02E-05, carp fillet, ingestion, EPC = 0.82 mg/kg)
- Recreational Fisher - carp fillet: RME (HI = 58)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 57.1, carp fillet, ingestion, EPC = 10 mg/kg)
- Recreational Fisher - carp fillet: MLE (HI = 7.25)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 7.14, carp fillet, ingestion, EPC = 10 mg/kg)

Fishing can occur in the Site Q Ponds; however, as noted in Section 2.3.3, fish are only present as a result of flood events. After the ponds dry out, fish are not reintroduced until another flood event, although water may collect in the ponds from precipitation. It is therefore extremely unlikely that a recreational fisher would be able to obtain 22 fish meals per year from the Site Q Ponds, as assumed by the RME scenario.

#### 7.5.8 Site R

As shown in Tables 7-1 and 7-3, there are exceedances of the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and target hazard index of 1 for several Site R receptor scenarios. The target endpoint analyses are presented in Appendix N. A summary is provided below. For each receptor the total risk or total HI is presented. COCs are identified for both potential carcinogenic and noncarcinogenic effects. For COCs identified based on potential carcinogenic effects, the risk level, medium, pathway and EPC are identified. For potential noncarcinogenic effects, the target endpoint, HQ, medium, pathway and EPC are identified for each COC.

- Outdoor Industrial Worker: RME (Risk = 1.32E-03)
  - COC: Trichloroethylene (Risk = 1.31E-03, combined soil and leachate, inhalation of volatiles, EPC combined soil = 2200 mg/kg, EPC leachate = 150 mg/L)

- Outdoor Industrial Worker: RME (HI = 1.11)
  - COCs: none identified based on target endpoint analysis.
- Outdoor Industrial Worker: MLE (Risk = 1.36E-04)
  - COC: Trichloroethylene (Risk = 1.34E-04, leachate, inhalation of volatiles, EPC leachate = 150 mg/L)
- Construction/Utility Worker: RME (Risk = 9.79E-04)
  - COC: Trichloroethylene (Risk = 7.56E-04, combined soil and leachate, ingestion, dermal contact and inhalation, EPC combined soil = 2200 mg/kg, EPC leachate = 150 mg/L)
  - COC: Total PCBs (Risk = 1.17E-04, leachate, ingestion and dermal contact, EPC = 3.98 mg/L)
  - COC: 1,2-Dichloroethane (Risk = 5.54E-05, leachate, inhalation of volatiles, EPC = 50 mg/L)
- Construction/Utility Worker: RME (HI = 232)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 204, leachate, ingestion and dermal contact, EPC = 3.98 mg/L)
  - COC: Trichloroethylene (liver effects, HQ = 12.7, combined soil and leachate, ingestion and dermal contact; neurological effects, HQ = 3.75, combined soil and leachate, inhalation of volatiles; EPC combined soil = 2200 mg/kg, EPC leachate = 150 mg/L)
  - COC: 1,2-Dichloroethane (liver, kidney, GI and skin effects, HQ = 8.42, leachate, inhalation of volatiles, EPC leachate = 50 mg/L)
  - COC: Mercury (immune effects, HQ = 0.747, combined soil, ingestion and dermal contact, EPC = 699 mg/kg)
- Construction/Utility Worker: MLE (Risk = 3.17E-04)
  - COC: Trichloroethylene (Risk = 2.19E-04, leachate, inhalation of volatiles, EPC leachate = 150 mg/L)
- Construction/Utility Worker: MLE (HI = 112)
  - COC: Total PCBs (immune, skin and eye effects, HQ = 102, leachate, ingestion and dermal contact, EPC = 3.98 mg/L)
  - COC: Trichloroethylene (liver effects, HQ = 5.76, leachate, ingestion and dermal contact; EPC leachate = 150 mg/L)
  - COC: 1,2-Dichloroethane (liver, kidney, GI and skin effects, HQ = 2.53, leachate, inhalation of volatiles, EPC leachate = 50 mg/L)

Site R is a closed industrial-waste disposal area owned by Solutia, Inc. The site is not currently used. Access to Site R is restricted by fencing and is monitored by Solutia plant personnel. Therefore, the potential risks presented above represent the future scenario. It is unlikely that an outdoor industrial worker will access the site 190 days per year in the future. Excavation is not allowed at Site R unless a permit is obtained from the plant and appropriate measures are taken to protect workers undertaking intrusive activities. Therefore, the risk assessment for the construction/utility worker represents a very conservative scenario.

#### **7.5.9 Site S**

As shown in Tables 7-1 and 7-3, there are exceedances of the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and target hazard index of 1 for several Site S receptor scenarios. The target endpoint analyses are presented in Appendix N. A summary is provided below. For each receptor the total risk or total HI is presented. COCs are identified for both potential carcinogenic and noncarcinogenic effects. For COCs identified based on potential carcinogenic effects, the risk level, medium, pathway and EPC are identified. For potential noncarcinogenic effects, the target endpoint, HQ, medium, pathway and EPC are identified for each COC.

- Outdoor Industrial Worker: RME (Risk = 3.24E-04)
  - COC: Total PCBs (Risk = 2.37E-04, surface soil, ingestion and dermal contact, EPC = 1010 mg/kg)
- Outdoor Industrial Worker: RME (HI = 16.9)
  - COCs: Total PCBs (immune, skin and eye effects, HQ = 16.6, surface soil, ingestion and dermal contact, EPC = 1010 mg/kg)
- Outdoor Industrial Worker: MLE (HI = 5.23)
  - COCs: Total PCBs (immune, skin and eye effects, HQ = 5.17, surface soil, ingestion and dermal contact, EPC = 504 mg/kg)
- Construction/Utility Worker: RME (HI = 9.19)
  - COCs: Total PCBs (immune, skin and eye effects, HQ = 8.56, combined soil, ingestion and dermal contact, EPC = 1010 mg/kg)
- Trespasser: RME (HI = 6.96)
  - COCs: Total PCBs (immune, skin and eye effects, HQ = 6.91, surface soil, ingestion and dermal contact, EPC = 1010 mg/kg)

The 1-acre site is currently not used. The northern portion of the site is grassed, and its southern portion is covered with gravel and fenced. Therefore, the potential risks presented above for workers

represent the future scenario only, and the exposure frequency assumptions are very conservative given the small size of the site. Additionally, due to the fencing of portions of the site and the small size, trespassers are unlikely to access the site frequently.

#### **7.5.10 Mississippi River**

As shown on Tables 7-2 and 7-4 all potential risks and HIs calculated for both the RME and MLE receptor scenarios for the Mississippi River recreational fisher and trespassing teenage scenarios are within or below the USEPA's target risk range of  $10^{-6}$  to  $10^{-4}$  and below the target HI of 1.

#### **7.5.11 COC Summary**

The COCs identified above are summarized in Table 7-5 and in Figure 7-1.

**TABLE 7.1**  
**SUMMARY OF POTENTIAL CARCINOGENIC RISKS FOR ALL RECEPTORS - SITES**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RUPB**

Medium (Pathways)	Receptor															
	O		O North		P		Q North		Q Central		Q South		Q Pond		R (a)	
	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE
<b>Indoor Industrial Worker (IW)</b> Groundwater/Leachate to Indoor Air (inh)	NCOPC	NCOPC	1.10E-06	1.82E-06	NC	NC	8.72E-06	1.53E-06	NC	NC	1.21E-06	2.12E-07	NA	NA	1.01E-07	1.77E-06
<b>Outdoor Industrial Worker (OW)</b> Surface Soil (ing/derm)	5.65E-05	5.14E-06	6.25E-04	1.12E-04	3.41E-06	2.32E-07	1.10E-06	1.03E-07	3.13E-06	1.98E-06	1.82E-06	1.41E-06	NA	NA	NCOPC	NC
Surface Soil to Outdoor Air (inh)	9.19E-06	3.06E-07	2.83E-06	2.95E-07	4.80E-06	4.13E-07	1.07E-06	8.07E-08	2.20E-06	1.67E-06	4.58E-07	3.70E-08	NA	NA	6.15E-04	1.27E-06
Groundwater/Leachate to Outdoor Air (inh)	NCOPC	NC	2.36E-06	4.12E-09	NC	NC	4.49E-07	7.86E-06	NC	NC	1.05E-06	1.83E-09	NA	NA	7.04E-04	1.23E-04
<b>Total Potential Risk:</b>	<b>6.57E-05</b>	<b>5.45E-06</b>	<b>6.28E-04</b>	<b>1.13E-04</b>	<b>6.22E-06</b>	<b>6.45E-07</b>	<b>2.62E-06</b>	<b>2.82E-07</b>	<b>3.13E-06</b>	<b>1.98E-06</b>	<b>1.87E-06</b>	<b>1.48E-06</b>	<b>NA</b>	<b>NA</b>	<b>1.32E-03</b>	<b>1.36E-04</b>
<b>Construction/Utility Worker (CW)</b> Combined Soil (ing/derm)	8.44E-06	7.06E-07	1.26E-04	3.13E-05	2.36E-07	4.47E-08	2.80E-06	5.19E-07	8.94E-07	2.20E-07	1.16E-06	2.08E-07	NA	NA	3.56E-06	3.70E-07
Combined Soil to Outdoor Air (inh)	3.05E-06	1.81E-07	2.00E-06	3.87E-07	6.87E-07	8.55E-08	2.15E-07	2.96E-08	1.78E-06	3.47E-06	1.81E-07	3.51E-08	NA	NA	4.14E-06	1.43E-06
Groundwater (ing/derm)	1.38E-06	6.79E-07	7.81E-06	3.81E-06	NC	NC	8.96E-06	3.48E-06	NC	NC	NC	NC	NA	NA	1.77E-04	8.96E-06
Groundwater/Leachate to Outdoor Air (inh)	NCOPC	NCOPC	8.58E-06	2.57E-06	NC	NC	2.91E-06	7.52E-07	NC	NC	NC	NC	NA	NA	7.67E-04	2.27E-04
<b>Total Potential Risk:</b>	<b>1.28E-05</b>	<b>1.57E-06</b>	<b>1.36E-04</b>	<b>3.55E-05</b>	<b>6.93E-07</b>	<b>1.30E-07</b>	<b>1.25E-06</b>	<b>4.78E-06</b>	<b>9.12E-07</b>	<b>2.23E-07</b>	<b>1.34E-06</b>	<b>2.41E-07</b>	<b>NA</b>	<b>NA</b>	<b>9.79E-04</b>	<b>3.17E-04</b>
<b>Trespassing Teenager (TT)</b> Surface Soil (ing/derm)	1.06E-06	1.54E-06	1.17E-04	3.32E-05	6.21E-07	6.38E-08	2.04E-07	2.97E-08	5.86E-06	5.90E-07	3.41E-06	4.16E-07	NA	NA	NC	NC
Surface Soil to Outdoor Air (inh)	1.54E-07	1.24E-08	4.78E-06	1.16E-06	8.07E-06	1.85E-06	1.79E-06	3.23E-09	3.70E-10	6.89E-11	7.70E-09	1.48E-09	NA	NA	1.03E-05	5.07E-07
Groundwater/Leachate to Outdoor Air (inh)	NC	NC	3.96E-10	1.65E-10	NC	NC	7.56E-09	3.14E-09	NC	NC	1.79E-10	7.34E-11	NA	NA	1.18E-06	4.93E-06
Surface Water (ing/derm)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NC	NC
Sediment (ing/derm)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NC	NC
<b>Total Potential Risk:</b>	<b>1.67E-06</b>	<b>1.55E-06</b>	<b>1.17E-04</b>	<b>3.32E-05</b>	<b>7.02E-07</b>	<b>8.94E-08</b>	<b>2.36E-07</b>	<b>3.61E-08</b>	<b>5.86E-06</b>	<b>5.90E-07</b>	<b>3.42E-06</b>	<b>4.16E-07</b>	<b>NA</b>	<b>NA</b>	<b>2.22E-05</b>	<b>5.44E-06</b>
<b>Recreational Fishes</b> Surface Water (ing/derm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NC	NC	NA	NA
Fish Fillet Black Bullhead Fillet (ing)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.49E-04	2.06E-05	NA	NA
Fish Fillet Carp Fillet (ing)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.45E-03	5.44E-05	NA	NA
<b>Total Potential Risk (Black Bullhead Fillet):</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>5.49E-04</b>	<b>2.06E-05</b>	<b>NA</b>	<b>NA</b>
<b>Total Potential Risk (Carp Fillet):</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>	<b>1.45E-03</b>	<b>5.44E-05</b>	<b>NA</b>	<b>NA</b>
<b>Notes</b> derm dermal contact ing ingestion inh inhalation MLE Most Likely Exposure NA Not Applicable Receptor not assumed to be exposed via this pathway NC Not Calculated No constituents of potential concern were identified for this pathway NCOPC No COPCs identified for this pathway RME Reasonable Maximum Exposure (a) Site R has both a groundwater location and a leachate well in the mid-groundwater depth range. Potential inhalation exposures for receptors potentially exposed to mid-depth groundwater (IW OW TT) were calculated for both leachate and groundwater. The higher potential risk is shown here.																

TABLE 7-2  
SUMMARY OF POTENTIAL CARCINOGENIC RISKS FOR ALL RECEPTORS - MISSISSIPPI RIVER  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RWFS

Medium (Pathways)	River							
	River		DDA		PDA		UDA	
	RME	MLE	RME	MLE	RME	MLE	RME	MLE
<b><u>Trespassing Teenager (TT)</u></b>								
Surface Water (ing/derm)	NC	NC	NC	NC	NC	NC	NC	NC
Sediment (ing/derm)	2.19E-08	5.87E-09	NC	NC	NC	NC	NC	NC
<b>Total Potential Risk:</b>	<b>2.19E-08</b>	<b>5.87E-09</b>	<b>NC</b>	<b>NC</b>	<b>NC</b>	<b>NC</b>	<b>NC</b>	<b>NC</b>
<b><u>Recreational Fisher</u></b>								
Surface Water (ing/derm)	NC	NC	NC	NC	NC	NC	NC	NC
Sediment (ing/derm)	NC	NC	6.97E-08	1.44E-09	6.97E-08	1.44E-09	6.97E-08	1.44E-09
Fish Fillet, Buffalo Fillet (ing)	NC	NC	4.02E-05	1.51E-06	4.59E-06	1.45E-07	5.43E-06	2.04E-07
<b>Total Potential Risk:</b>	<b>NC</b>	<b>NC</b>	<b>4.03E-05</b>	<b>1.51E-06</b>	<b>4.66E-06</b>	<b>1.46E-07</b>	<b>5.50E-06</b>	<b>2.05E-07</b>
Notes: DDA - Downstream Discharge Area (Mississippi River). derm - dermal contact ing - ingestion inh - inhalation MLE - Maximum Likely Exposure NC - Not Calculated. No constituents of potential concern were identified for this pathway. PDA - Plume Discharge Area (Mississippi River) RME - Reasonable Maximum Exposure. UDA - Upstream Discharge Area (Mississippi River)								

TABLE 7-3  
SUMMARY OF POTENTIAL HAZARD INDICES FOR ALL RECEPTORS - SITES  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 R/Fs

Medium (Pathways)	Sites															
	O		O North		P		Q North		Q Central		Q South		Q Pond		R (a)	
	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE	RME	MLE
<b>Indoor Industrial Worker (IW)</b>																
Groundwater/Leachate to Indoor Air (inh)	NCOPC	NCOPC	5.84E-04	3.66E-04	NC	NC	3.76E-04	2.31E-04	NC	NC	2.18E-03	1.35E-03	NA	NA	1.52E-03	9.48E-04
<b>Outdoor Industrial Worker (OW)</b>																
Surface Soil (ing/derm)	1.79E-01	5.57E-02	1.19E+01	7.33E+00	1.25E-01	2.15E-02	6.67E-02	1.08E-02	4.71E-02	1.27E-02	1.24E-01	4.23E-02	NA	NA	NCOPC	NCOPC
Surface Soil to Outdoor Air (inh)	4.00E+00	4.62E+01	1.58E+00	6.68E-01	2.43E-01	1.77E-02	3.10E-02	8.38E-03	NC	NC	1.23E-01	3.08E-02	NA	NA	4.73E-01	4.45E-02
Groundwater/Leachate to Outdoor Air (inh)	NCOPC	NCOPC	1.68E-03	1.05E-03	NC	NC	7.73E-03	4.63E-03	NC	NC	4.44E-04	2.78E-04	NA	NA	6.34E-01	3.96E-01
Total Potential Hazard Index	4.18E+00	5.19E+01	1.33E+01	9.99E+00	3.68E-01	3.92E-02	1.96E-01	2.46E-02	4.71E-02	1.27E-02	2.48E-01	7.38E-02	NA	NA	1.11E+00 (b)	4.41E-01
<b>Construction/Utility Worker (CW)</b>																
Combined Soil (ing/derm)	2.61E+00	2.21E-01	2.88E+01	5.60E+00	1.69E-01	1.78E-02	5.00E-01	9.68E-02	7.76E-02	1.33E-02	1.83E-01	2.40E-02	NA	NA	3.09E+00	3.13E-01
Combined Soil to Outdoor Air (inh)	1.88E+01	1.05E+00	5.10E+00	1.02E+00	4.08E-01	1.52E-02	1.28E-01	1.68E-02	1.70E-01	3.32E-02	4.36E-01	6.57E-02	NA	NA	8.10E-01	3.68E-02
Groundwater/Leachate to Outdoor Air (inh)	1.20E-03	5.98E-04	3.13E+00	1.56E+00	NC	NC	1.08E+01	5.32E+00	NC	NC	NC	NC	NA	NA	2.18E+02	1.08E+02
Groundwater/Leachate to Outdoor Air (inh)	NCOPC	NCOPC	4.82E-02	1.45E-02	NC	NC	3.90E-01	1.17E-01	NC	NC	NC	NC	NA	NA	1.18E+01	3.54E+00
Total Potential Hazard Index	2.14E+01	1.27E+00 (b)	3.48E+01	8.20E+00	5.78E-01	3.29E-02	1.17E+01	5.55E+00	2.47E-01	4.65E-02	6.29E-01	6.97E-02	NA	NA	2.32E+02	1.12E+02
<b>Trespassing Teenager (TT)</b>																
Surface Soil (ing/derm)	7.46E-02	1.01E-02	4.80E+00	1.33E+00	5.21E-02	3.85E-03	2.78E-02	1.94E-03	1.96E-02	2.28E-03	5.16E-02	7.52E-03	NA	NA	NC	NC
Surface Soil to Outdoor Air (inh)	1.53E-01	1.18E-02	6.07E-02	1.70E-02	9.30E-03	4.51E-04	1.19E-03	2.14E-04	NC	NC	4.70E-03	7.88E-04	NA	NA	1.81E-02	1.13E-03
Groundwater/Leachate to Outdoor Air (inh)	NC	NC	6.40E-05	2.67E-05	NC	NC	2.95E-04	1.23E-04	NC	NC	1.70E-06	7.07E-08	NA	NA	2.42E-02	1.01E-02
Surface Water (ing/derm)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	2.13E-04	1.15E-04	NA	NA	NC	NC
Sediment (ing/derm)	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NA	NA	NC	NC
Total Potential Hazard Index	2.27E-01	2.19E-02	4.97E+00	1.34E+00	6.14E-02	4.30E-03	2.93E-02	2.28E-03	1.96E-02	2.28E-03	5.65E-02	8.43E-03	NA	NA	4.23E-02	1.12E-02
<b>Recreational Fisher</b>																
Surface Water (ing/derm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.48E-04	3.82E-05	NA	NA
Fish Fillet Black Bullhead Fillet (ing)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.29E+01	2.86E+00	NA	NA
Fish Fillet Carp Fillet (ing)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.80E+01	7.25E+00	NA	NA
Total Potential Hazard Index (Black Bullhead Fillet)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.29E+01	2.86E+00	NA	NA
Total Potential Hazard Index (Carp Fillet)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	5.80E+01	7.25E+00	NA	NA
<b>Notes</b> derm - dermal contact ing - ingestion inh - inhalation MLE - Most Likely Exposure NA - Not Applicable Receptor not assumed to be exposed via this pathway NC - Not Calculated No constituents of potential concern were identified for this pathway RME - Reasonable Maximum Exposure (a) - Site R has both a groundwater location and a leachate well in the mid-groundwater depth range. Potential inhalation exposures for receptors potentially exposed to mid-depth groundwater (IW, OW, TT) were calculated for both leachate and groundwater. The higher potential risk is shown here. (b) Target endpoint analysis (Appendix N) indicates no target endpoint - based HI exceedances.																

TABLE 7-4  
SUMMARY OF POTENTIAL HAZARD INDICES FOR ALL RECEPTORS - MISSISSIPPI RIVER  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RUFFS

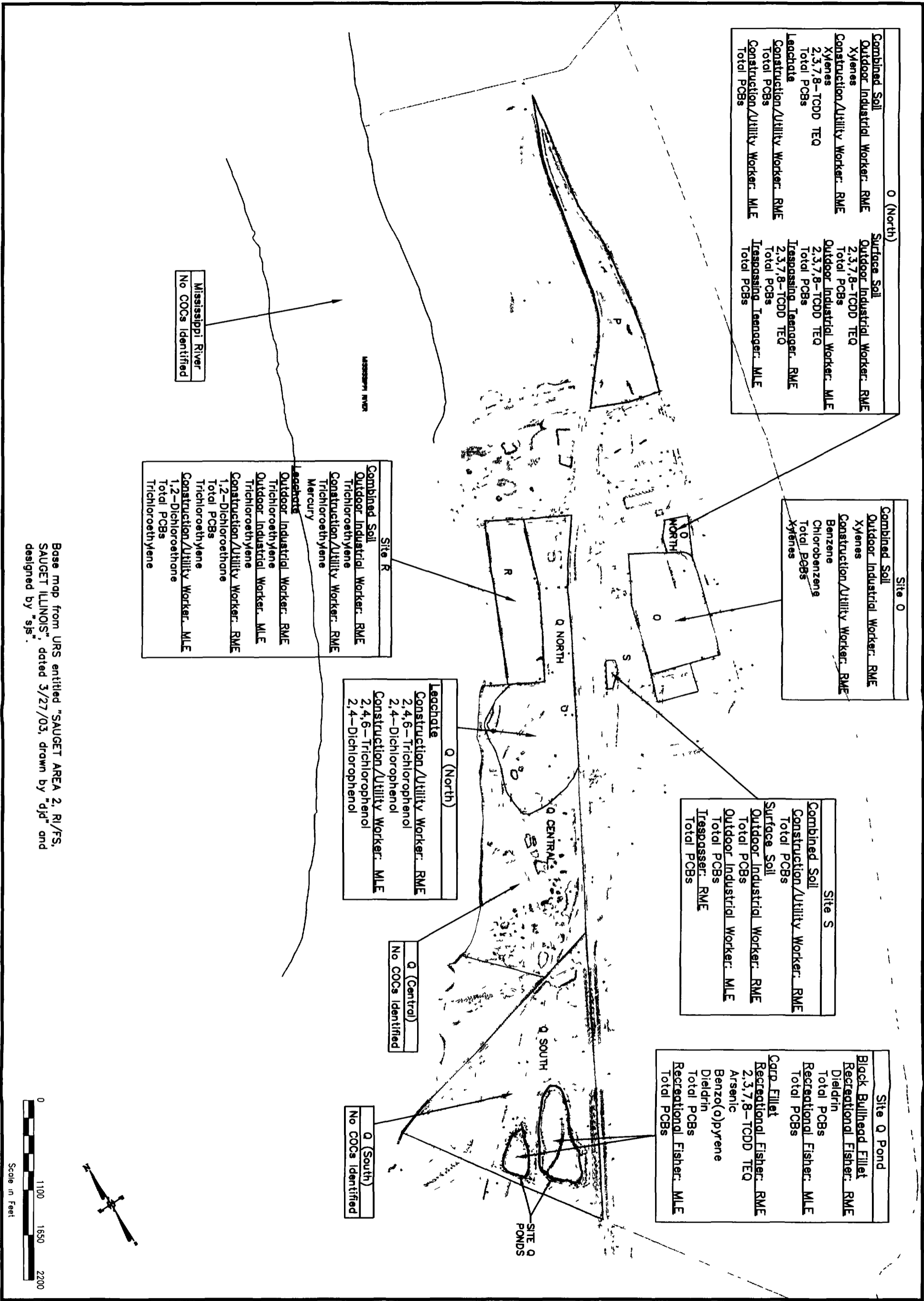
Medium (Pathways)	River							
	River		DDA		PDA		UDA	
	RME	MLE	RME	MLE	RME	MLE	RME	MLE
<b><u>Trespassing Teenager (TT)</u></b>								
Surface Water (ing/derm)	1.12E-02	5.96E-03	NC	NC	NC	NC	NC	NC
Sediment (ing/derm)	3.10E-04	8.31E-05	NC	NC	NC	NC	NC	NC
Total Potential Hazard Index:	1.15E-02	6.04E-03	NC	NC	NC	NC	NC	NC
<b><u>Recreational Fisher</u></b>								
Surface Water (ing/derm)	NC	NC	1.51E-02	1.96E-03	1.51E-02	1.96E-03	1.51E-02	1.96E-03
Sediment (ing/derm)	NC	NC	3.62E-04	2.49E-05	3.62E-04	2.49E-05	3.62E-04	2.49E-05
Fish Fillet, Buffalo Fillet (ing)	NC	NC	2.24E-02	2.80E-03	NC	NC	NC	NC
Total Potential Hazard Index:	NC	NC	3.79E-02	4.79E-03	1.55E-02	1.99E-03	1.55E-02	1.99E-03
Notes: DDA - Downstream Discharge Area (Mississippi River) derm - dermal contact. ing - ingestion inh - inhalation MLE - Maximum Likely Exposure NC - Not Calculated. No constituents of potential concern were identified for this pathway. PDA - Plume Discharge Area (Mississippi River) RME - Reasonable Maximum Exposure UDA - Upstream Discharge Area (Mississippi River)								

TABLE 7-3  
SUMMARY OF CONSTITUENTS OF CONCERN (COCs)  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Site	Receptor	Scenario	COC	Cancer (a) Potential Risk	Non-Cancer (a)		Medium	Pathway	EPC	Units
					HQ	Endpoint				
O	Outdoor Industrial Worker	RME	Xylenes	ND	3.23	Neurological	Combined soil	Inhalation	14000	mg/kg
O	Construction/Utility Worker	RME	Chlorobenzene	ND	1	Liver	Combined soil	Inhalation	780	mg/kg
O	Construction/Utility Worker	RME	Xylenes	ND	14.2	Neurological	Combined soil	Inhalation	14000	mg/kg
O	Construction/Utility Worker	RME	Benzene	NCOC	3.16	Immune	Combined soil	Inhalation	500	mg/kg
O	Construction/Utility Worker	RME	PCBs	NCOC	2.53	Immune, skin, eye	Combined soil	Ingestion/Dermal	298	mg/kg
O North	Outdoor Industrial Worker	RME	PCBs	1.66E-04	11.6	Immune, skin, eye	Surface soil	Ingestion/Dermal	709	mg/kg
O North	Outdoor Industrial Worker	RME	2,3,7,8-TCDD TEQ	4.59E-04	ND	ND	Surface soil	Ingestion/Dermal	0.0508	mg/kg
O North	Outdoor Industrial Worker	RME	Xylenes	ND	1.23	Neurological	Combined soil	Inhalation	3900	mg/kg
O North	Outdoor Industrial Worker	MLE	PCBs	NCOC	7.27	Immune, skin, eye	Surface soil	Ingestion/Dermal	709	mg/kg
O North	Outdoor Industrial Worker	MLE	2,3,7,8-TCDD TEQ	8.32E-05	ND	ND	Surface soil	Ingestion/Dermal	0.0508	mg/kg
O North	Construction/Utility Worker	RME	2,3,7,8-TCDD TEQ	1.15E-04	ND	ND	Combined soil	Ingestion/Dermal	0.0508	mg/kg
O North	Construction/Utility Worker	RME	Xylenes	ND	3.95	Neurological	Combined soil	Inhalation	3900	mg/kg
O North	Construction/Utility Worker	RME	PCBs	NCOC	25.7	Immune, skin, eye	Combined soil	Ingestion/Dermal	3030	mg/kg
O North	Construction/Utility Worker	RME	PCBs	NCOC	2.81	Immune, skin, eye	Leachate	Ingestion/Dermal	0.055	mg/L
O North	Construction/Utility Worker	MLE	PCBs	NCOC	5.48	Immune, skin, eye	Combined soil	Ingestion/Dermal	1780	mg/kg
O North	Construction/Utility Worker	MLE	PCBs	NCOC	1.4	Immune, skin, eye	Leachate	Ingestion/Dermal	0.055	mg/L
O North	Trespassing Teenager	RME	PCBs	NCOC	4.86	Immune, skin, eye	Surface soil	Ingestion/Dermal	709	mg/kg
O North	Trespassing Teenager	RME	2,3,7,8-TCDD TEQ	8.62E-05	ND	ND	Surface soil	Ingestion/Dermal	0.0508	mg/kg
O North	Trespassing Teenager	MLE	PCBs	NCOC	1.33	Immune, skin, eye	Surface soil	Ingestion/Dermal	709	mg/kg
O North	Construction/Utility Worker	RME	2,4,6-Trichlorophenol	NCOC	8.43	Reproductive	Leachate	Ingestion/Dermal	12.5	mg/L
Q North	Construction/Utility Worker	RME	2,4-Dichlorophenol	ND	1.82	Immune	Leachate	Ingestion/Dermal	170	mg/L
Q North	Construction/Utility Worker	MLE	2,4,6-Trichlorophenol	NCOC	4.21	Reproductive	Leachate	Ingestion/Dermal	12.5	mg/L
Q North	Construction/Utility Worker	MLE	2,4-Dichlorophenol	ND	0.907	Immune	Leachate	Ingestion/Dermal	170	mg/L
Q Pond	Recreational Fisher	RME	PCBs	3.79E-04	22.1	Immune, skin, eye	Black bullhead fillet	Ingestion	3.87	mg/kg
Q Pond	Recreational Fisher	RME	Dieldrin	7.84E-05	NCOC	NCOC	Black bullhead fillet	Ingestion	0.1	mg/kg
Q Pond	Recreational Fisher	MLE	PCBs	NCOC	2.78	Immune, skin, eye	Black bullhead fillet	Ingestion	3.87	mg/kg
Q Pond	Recreational Fisher	RME	PCBs	9.80E-04	57.1	Immune, skin, eye	Carp fillet	Ingestion	10	mg/kg
Q Pond	Recreational Fisher	RME	Dieldrin	1.49E-04	NCOC	NCOC	Carp fillet	Ingestion	0.19	mg/kg
Q Pond	Recreational Fisher	RME	2,3,7,8-TCDD TEQ	1.35E-04	ND	ND	Carp fillet	Ingestion	1.84E-05	mg/kg
Q Pond	Recreational Fisher	RME	Benzo(a)pyrene	6.44E-05	ND	ND	Carp fillet	Ingestion	0.18	mg/kg
Q Pond	Recreational Fisher	RME	Arsenic	6.02E-05	NCOC	NCOC	Carp fillet	Ingestion	0.82	mg/kg
Q Pond	Recreational Fisher	MLE	PCBs	NCOC	7.14	Immune, skin, eye	Carp fillet	Ingestion	10	mg/kg
R	Outdoor Industrial Worker	RME	Trichloroethylene	6.12E-04	NCOC	NCOC	Combined soil	Inhalation	2200	mg/kg
R	Outdoor Industrial Worker	RME	Trichloroethylene	6.93E-04	NCOC	NCOC	Leachate	Inhalation	150	mg/L
R	Outdoor Industrial Worker	MLE	Trichloroethylene	1.34E-04	NCOC	NCOC	Leachate	Inhalation	150	mg/L
R	Construction/Utility Worker	RME	Trichloroethylene	4.33E-05	1.22	Liver	Combined soil	Ingestion/Dermal	2200	mg/kg
R	Construction/Utility Worker	RME	Trichloroethylene	7.13E-04	14.43	Liver, Neurological	Leachate	Ingestion/Dermal/Inhalation	150	mg/L
R	Construction/Utility Worker	RME	PCBs	1.17E-04	204	Immune, skin, eye	Leachate	Ingestion/Dermal	3.98	mg/L
R	Construction/Utility Worker	RME	1,2-Dichloroethane	5.54E-05	8.42	Liver, kidney, GI, and skin	Leachate	Inhalation	50	mg/L
R	Construction/Utility Worker	RME	Mercury	ND	0.747	Immune	Combined soil	Ingestion/Dermal	899	mg/kg
R	Construction/Utility Worker	MLE	Trichloroethylene	2.19E-04	5.76	Liver	Leachate	Inhalation	150	mg/L
R	Construction/Utility Worker	MLE	PCBs	NCOC	102	Immune, skin, eye	Leachate	Ingestion/Dermal	3.98	mg/L
R	Construction/Utility Worker	MLE	1,2-Dichloroethane	NCOC	2.53	Liver, kidney, GI, and skin	Leachate	Inhalation	50	mg/L

TABLE 7-5  
SUMMARY OF CONSTITUENTS OF CONCERN (COCs)  
HUMAN HEALTH RISK ASSESSMENT  
SAUGET AREA 2 RI/FS  
SAUGET, ILLINOIS

Site	Receptor	Scenario	COC	Cancer (a) Potential Risk	Non-Cancer (a)		Medium	Pathway	EPC	Units
					HQ	Endpoint				
S	Outdoor Industrial Worker	RME	PCBs	2.37E-04	16.6	Immune, skin, eye	Surface soil	Ingestion/Dermal	1010	mg/kg
S	Outdoor Industrial Worker	MLE	PCBs	NCOC	5.17	Immune, skin, eye	Surface soil	Ingestion/Dermal	504	mg/kg
S	Construction/Utility Worker	RME	PCBs	NCOC	8.56	Immune, skin, eye	Combined soil	Ingestion/Dermal	1010	mg/kg
S	Trespassing Teenager	RME	PCBs	NCOC	6.91	Immune, skin, eye	Surface soil	Ingestion/Dermal	1010	mg/kg
Notes: EPC - Exposure point concentration. GI - Gastrointestinal. HQ - Hazard Quotient. MLE - Most Likely Exposure. NCOC - Not a constituent of concern via this pathway. ND - No Dose-Response value for this pathway. PCBs - Polychlorinated Biphenyls. RME - Reasonable Maximum Exposure. TCDD-TEQ - 2,3,7,8-Tetrachlorodibenzo-p-dioxin Toxic Equivalents Concentration. (a) - Only constituents driving a risk exceedance are presented on this table.										



Base map from URS entitled "SAUGET AREA 2, RI/FS, SAUGET ILLINOIS", dated 3/27/03, drawn by "djd" and designed by "sjs".

**7-1**

**7-1**

**7-1**

**CONSTITUENTS OF CONCERN (COCs)**  
**HUMAN HEALTH RISK ASSESSMENT**  
**SAUGET AREA 2 RI/FS**  
**SAUGET, IL**

SCALE:	DATE:	PROJECT NUMBER:
1"=1100'	7/03	06105-009

**ENSR**  
INTERNATIONAL  
2 TECHNOLOGY PARK DRIVE  
WESTFORD, MASSACHUSETTS 01886  
PHONE: (978) 569-3000  
FAX: (978) 569-3100  
WEB: WWW.ENSUR.COM

DESIGNED BY:	NO.	DESCRIPTION	DATE	BY:
KS				
DRAWN BY:				
BLB				
CHECKED BY:				
KS				
APPROVED BY:				
KS				



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